



**US Army Corps
of Engineers**

Kansas City District

**INTENSIVE ARCHEOLOGICAL RECONNAISSANCE
SURVEY OF NEWLY EXPOSED SHORELINE RESULTING
FROM THE DRAWDOWN OF HARLAN COUNTY LAKE,
HARLAN COUNTY, NEBRASKA**

Prepared by the U.S. Army Corps of Engineers,
Kansas City District

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<p>From June to October 1992, an intensive reconnaissance survey of cultural resources exposed by a drawdown in lake elevation was conducted by the U.S. Army Corps of Engineers, Kansas City District at Harlan County Lake, Harlan County, Nebraska. The survey was conducted on the shoreline surrounding the lake west of Harlan County Dam and east of U.S. Highway 183. The purposes of this survey were: 1) to locate and identify archeological resources below the 1940' msl elevation on the shore exposed by a drawdown of the lake, 2) to assess the potential impact of erosional forces on those newly identified sites, and 3) to assess the impact of on-going erosional forces on sites already exposed by drawdown from 1945' msl to 1940' msl, surveyed in 1979, that might be further impacted by a drawdown of the lake to lower elevations, particularly those sites (over)</p>						
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19. potentially eligible for inclusion in the National Register of Historic Places (NRHP). Evaluation of erosional impact on sites previously recorded between 1945' and 1940' msl was used to assess potential impact on any newly identified sites.

Four (4) previously unrecorded sites were located and surveyed at Harlan County Lake: 25HN82, 25HN83, 25HN84, and 25HN85. At the request of the Nebraska State Historical Society, a historic site (25HN504) was surveyed, photographed and mapped. Twenty-eight (28) sites that had been previously recorded were relocated and assessed for impact analysis.

ABSTRACT

From June to October 1992, an intensive reconnaissance survey of cultural resources exposed by a drawdown in lake elevation was conducted by the U.S. Army Corps of Engineers, Kansas City District at Harlan County Lake, Harlan County, Nebraska. The survey was conducted on the shoreline surrounding the lake west of Harlan County Dam and east of U.S. Highway 183. The purposes of this survey were: 1) to locate and identify archeological resources below the 1940' msl elevation on the shore exposed by a drawdown of the lake, 2) to assess the potential impact of erosional forces on those newly identified sites, and 3) to assess the impact of on-going erosional forces on sites already exposed by drawdown from 1945' msl to 1940' msl, surveyed in 1979, that might be further impacted by a drawdown of the lake to lower elevations, particularly those sites potentially eligible for inclusion in the National Register of Historic Places (NRHP). Evaluation of erosional impact on sites previously recorded between 1945' and 1940' msl was used to assess potential impact on any newly identified sites.

Four (4) previously unrecorded sites were located and surveyed at Harlan County Lake: 25HN82, 25HN83, 25HN84, and 25HN85. At the request of the Nebraska State Historical Society, a historic site (25HN504) was surveyed, photographed and mapped. Twenty-eight (28) sites that had been previously recorded were relocated and assessed for impact analysis.

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I want to express my deepest thanks to the many people who have contributed to the success of this survey and report. Specifically, I want to thank Mr. Phil Bailey and Mr. Larry Janicek of the U.S. Army Corps of Engineers, Harlan County Project Office, for all of their help and consideration while I was stationed there to do the field work. I would also like to thank my colleagues at the Corps of Engineers, Kansas City District Office, Mr Robert R. Ruf, Dr. Robert Ziegler, Ms. Mary Lucido, and Mrs. Camille Lechlitter for their helpful comments and keen interest in the project. I would also like to thank Ms. Melissa Ekberg, a member of the Corps of Engineers Volunteer Program, who helped me survey the hottest, driest, and flattest portion of the exposed lake bed in midsummer. Finally, I would like to express my gratitude to all the citizens of Republican City, Alma, Orleans, and other areas of Harlan County, Nebraska, for their hospitality and their friendship and for the many bits and pieces of Harlan County oral history that have added to the thoroughness of this report.

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGEMENTS.....	ii
TABLE OF CONTENTS	iii
LIST OF FIGURES AND TABLES	iv
CHAPTER ONE: INTRODUCTION	1
CHAPTER TWO: BACKGROUND RESEARCH	3
CHAPTER THREE: FIELD METHODS	6
CHAPTER FOUR: PREVIOUS FIELD INVESTIGATIONS	14
CHAPTER FIVE: ENVIRONMENTAL SETTING	17
CHAPTER SIX: CULTURAL HISTORY	24
CHAPTER SEVEN: RESULTS	38
CHAPTER EIGHT: ANALYSIS OF IMPACT TO SITES.....	51
CHAPTER NINE: RECOMMENDATIONS	58
BIBLIOGRAPHY	62
APPENDIX	71
GLOSSARY OF TECHNICAL TERMS	76

LIST OF TABLES AND FIGURES

FIGURE 1. Map of Harlan County Lake Showing Area Surveyed, Previously-Recorded and Newly- Recorded Sites	8
FIGURE 2. Idealized Transect Grid	10
FIGURE 3. Idealized Parallel Transect	11
FIGURE 4. Prehistoric Lithics	41
FIGURE 5. Prehistoric Ceramics	41
FIGURE 6. Historic Ceramics	47
FIGURE 7. Historic Bottle Glass from 25HN82	47
 TABLE 1. Geologic Chronology: Harlan County	20
TABLE 2. Cultural Chronology: Harlan County	28
TABLE 3. Artifacts Collected: 1992	42
TABLE 4. Isolated Finds	49

CHAPTER ONE

INTRODUCTION

During the last week of June 1992, lake levels at Harlan County Lake, Harlan County, Nebraska began to be lowered by the release of water for agricultural irrigation. By 4 September 1992, when outflow of irrigation water ceased, the elevation of the surface of Harlan County Lake had drawn down to 1931.8 feet above mean sea level (msl). The purposes of this intensive reconnaissance survey of cultural resources at Harlan County Lake by the U.S. Army Corps of Engineers were:

- 1.) to conduct an archeological pedestrian survey of and to test, in a limited fashion, previously unsurveyed, newly exposed shoreline resulting from the drawdown from 1940' msl elevation to the 1,931.8' msl elevation level in order to locate and identify archeological resources,
- 2.) to assess the potential impact of erosional forces on those newly identified sites, and
- 3.) to assess the impact of on-going erosional forces on sites already exposed by drawdown of the multipurpose pool from 1945' msl to 1940' msl that may be further impacted by the drawdown to the 1931.8' msl elevation, particularly those sites potentially eligible for inclusion in the National Register of Historic Places (NRHP).

Previously recorded sites between 1945' and 1940' msl had already been exposed to similar erosional impacts resulting from drawdown of the lake elevation on similar archeological contexts in the area encompassed by the current survey for at least the preceding four years. Therefore, relocation and visual inspection of them provided an excellent opportunity to compare the result of four years of impact and thus better assess potential impacts to any sites identified during the current survey.

The results of the survey and site relocation were then used to develop recommendations for the preservation, protection and management of those cultural resources located on U.S. Government land in the Harlan County Lake area.

Two (2) new sites were recorded on the shore of Harlan County Lake between the 1940' msl elevation and the 1931.8' msl elevation: one prehistoric (the North Cove Mammoth site, 25HN85) and one historic site (Old Republican City, 25HN82) that appears to overlay one or more prehistoric settlements. In addition, two (2) previously unrecorded sites, 25HN83 and 25HN84, were identified on the project area that were not exposed by the drawdown of the lake but it was deemed necessary to survey and report them (see Appendix). At the request of the Nebraska State

Historical Society, another historic site (25HN504, the Old Orleans Mill) was surveyed and mapped. Twenty-eight (28) sites that had been previously recorded between the 1940' and 1945' elevations were relocated and assessed for impact analysis (see Appendix).

Limited collections of diagnostic artifacts and/or ecofacts were made during the course of the survey.

CHAPTER TWO

PRELIMINARY BACKGROUND RESEARCH

Because of the size of the area (~732.5 acres) to be surveyed, the investigation of the previously unsurveyed shoreline of Harlan County Lake was to be done in stages. Initially, background documentary research was carried out at the offices of the Planning Division, U.S. Army Corps of Engineers, Kansas City District and at the Harlan County Lake Project Office, Harlan County, Nebraska. Later, documentary materials concerning the prehistory and history of the lake area, the history of Harlan County, and manuscript reports of previous excavations in the county were searched and/or acquired from the Hoesch Memorial Library, Alma, NE, the Nebraska State Historical Society, Lincoln, NE, and the Midwest Archeological Center, National Park Service, Lincoln, NE. The State Historic Preservation Officer, Dr. Robert Bozell, Lincoln, NE, the Nebraska State Archeologist, Dr. Terry Steinacher, Fort Robinson, NE, and the Nebraska State Historian, Dr. Greg Miller, Lincoln, NE, were also consulted regarding previous investigations, requirements for site reporting, and matters concerning the assessment of contextual integrity in areas of lake drawdown. Dr. James H. Gunnerson, Director of Museum Studies, University of Nebraska - Lincoln, Lincoln, NE, was also interviewed because of his personal experience with excavations done during the 1948-52 University of Nebraska Archaeological Field School seasons and because of his expertise in Plains prehistory and, specifically, the prehistoric Plains Apache.

CURRENT PROJECT SETTING AND SURVEY CONDITIONS

Harlan County Lake is a multipurpose facility completed in 1952 to provide flood control in the Republican River Basin and to supply irrigation water to some 90,000 acres of land downstream from the dam. As a multipurpose facility it also provides recreation and fish and wildlife habitat. About 33% of U.S. Government land at Harlan County Lake is devoted to recreational use. Of this recreational acreage (5,454 acres), 39% is considered to be under intensive use. The Harlan County Project is located in Harlan County in south central Nebraska in the Republican River Drainage. The lake area is surrounded by the dissected loess hills that characterize the region. At full multipurpose pool level (1946 feet msl), the lake occupies 13,600 acres and contains 350,000 acre feet of water (Corps of Engineers 1948, 1951, 1987).

In the last four years the highest elevations of the lake have fluctuated between 1941' and 1934' msl. The lowest elevation reached in the last five years, and also the lowest level the pool had reached since the flooding of the river valley in 1952, was 1928.22' msl in October of 1991 after heavy irrigation demand

due to drought. The drawdown of the lake below the 1946' msl elevation has increased the shoreline area of the lake by approximately 1200 acres. The area between the 1946' msl and 1938.6' msl elevations was surveyed between 1979 and 1980 by Kathleen Roetzel of Impact Services Incorporated of Mankato, Minnesota. About 500 acres of shoreline were surveyed at that time. The current survey covered approximately 732.5 acres between the 1940' msl and 1931.8' msl elevations west of Harlan County Dam and east of U.S. Highway 183. During the current survey, the highest recorded lake elevation was 1933.76' msl and the lowest was 1931.8' msl.

The current survey also attempted to relocate sites identified by Roetzel during the 1979-80 survey to assess the effects of the drawdown on those sites since that survey. This was done to aid in assessing potential impacts to any new sites identified by the current survey. It was also useful data in developing a management plan for the cultural resources in the Harlan County Lake area.

Harlan County Lake has approximately 75 miles of shoreline. The immediate shoreline of the lake consists of muddy flat areas composed of sandy loess clays interspersed with occasional sandy deposits. The width of the shoreline varies with its slope. Shallowly sloping areas have shorelines up to $\frac{1}{4}$ mile wide. More steeply sloping shorelines vary from 10-75 meters wide. The entire lake area is bordered by cutbanks varying in height from 1-40 meters that were produced by wave action and other erosional forces acting on the hill slopes that composed the lake shores when the lake was at full pool elevation.

Newly exposed shoreline is unvegetated and visibility for pedestrian survey is 100%. However, immediately bordering the newly exposed shoreline is a dense growth of opportunistic vegetation, including smartweed (Polygonum spp.), curly dock (Rumex crispus), horseweed (Conyza canadensis), rough fleabane (Erigeron strigosus), yellow nutsedge (Cyperus esculentus), cattail (Typha angustifolia), bulrushes (Scirpus sp.) and a variety of thistles and grasses as well as woody plants like willows (Salix sp.) and cottonwoods (Populus sp.). The density of this overgrowth along the shoreline and particularly in the beds and mouths of the ephemeral creeks that feed the lake not only reduces visibility in those areas to 0% but also prevents access by pedestrian survey altogether. Farther up from the shore, from the approximate 1935' msl to the 1940' msl elevations, vegetation thins in areas where water is more scarce and soil is more compacted. Woody plants are also in evidence, including cottonwood (Populus sp.), willow (Salix sp.), and salt cedar (Tamarix sp.). In these areas visibility can range from 30-90%. Above the 1945' msl surface visibility decreases gradually from 50-5% as one moves up the slope of the shoreline to the cutbank. In this upper slope area, the vegetation becomes more and more

dense and woody and is comprised primarily of older cottonwoods and willows and the surface is obscured by a thick cover of leaf litter and weeds.

The cutbank faces are generally clear of vegetation and, where they are accessible, the soils strata underlying the hills and bluffs that border the lake are clearly visible. Atop the cutbanks and extending at least 5 m farther up the slope from the cutbank edges is a thick cover of grasses and forbs, including bluestems (Andropogon spp.), buffalo grass (Buchloe sp.), sunflowers (Helianthus annuus) and feral hemp (Cannabis sp.). Visibility on the upper slopes and in the immediate area of the cutbanks is generally 0-5%.

Although Harlan County is generally considered to be in a dry climatic region, averaging only 20 inches of precipitation per year (Mitchell et al. 1974), the summer of 1992 was an atypical season. Both in June and July, some sort of daily precipitation was recorded on nearly 50% of the days in those months. In fact, during a period of several days in July, the Republican River ran bank full and Prairie Dog Creek overtopped its banks after heavy rains in Kansas. These factors and the generally cool weather contributed to maintaining the lake at a higher than anticipated level. Thus, the anticipated drawdown elevation of 1929' msl was never reached. The rainy weather also hindered survey work by rendering the muddy flat areas of the shoreline very soft and inaccessible except on foot.

CHAPTER THREE

FIELD SURVEY METHODS

After the initial documentary research and consultations, it was decided that the newly exposed shoreline would be subjected to an intensive pedestrian survey and visual inspection. Priority was placed on locating and identifying sites below the 1,940' msl elevation. Collections would be made of artifacts if:

- 1) the artifacts were of significant diagnostic character,
- 2) significant or diagnostic artifacts were endangered by exposure to the elements or by removal by collectors or looters,
- 3) the artifacts identified unique or ephemeral sites that might be further damaged by exposure.

An attempt would also be made to determine if sites located were unique or the result of the erosion and redeposition of materials from an already reported site.

The primary goal of the current survey was to investigate areas where drawdown to 1931.8' msl or a lower elevation would expose areas of shoreline that had not been previously surveyed. This included areas where concentrations of previously identified sites indicated prehistoric settlement preferences. Such areas were identified by examination of maps of sites reported in the project area and by reference to models of settlement patterns generated by previous surveys of the area (Pepperl and Falk 1978, Roetzel 1982, Adair and Brown 1987, Moore 1988, Watkins 1988). Of particular concern were areas containing sites previously nominated or otherwise considered eligible for inclusion in the National Register of Historic Places.

Areas where drawdown might directly increase the impact of erosional forces on already identified sites were also included. This required relocation and visual inspection of such sites, particularly those between the 1945' and 1940' msl elevations that had already been exposed by earlier drawdown during the previous four years. Impact assessment was then based on direct observation of those sites and on prior studies of drawdown impact by the U.S. Army Corps of Engineers (Lenihan et al. 1977, Padgett 1978, Leatherman 1980, Lenihan et al. 1981, Mathewson (ed.) 1989, Nickens (ed.) 1991).

Finally, the survey also included areas outside of the limits described above as deemed necessary by the on-site archeologist or by his supervisors at the Kansas City District Office, U.S. Army Corps of Engineers.

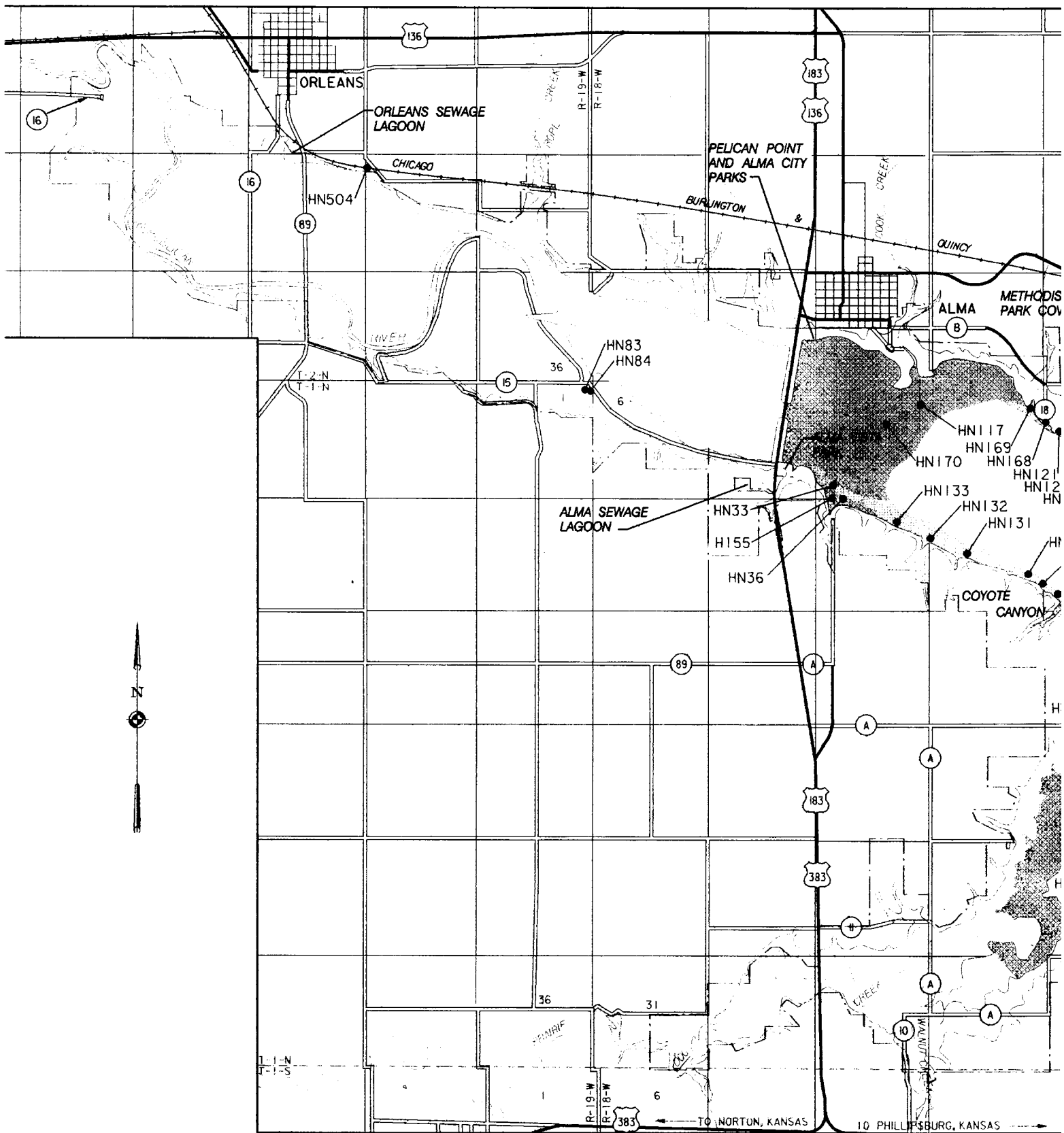
During the initial planning of the survey, it was determined that two large areas of the lake shore below the 1945' msl elevation had been covered with a deep layer of lake silts before having been exposed by drawdown during the last four years. These areas were also covered with dense weedy and woody overgrowth and were inaccessible to pedestrian survey and to other human impact. The first of these two areas was the extreme western end of the current lake shore bounded on the north by the town of Alma, Nebraska, on the south by Alma Vista Park, on the west by U.S. Highway 183 and on the east by the lake itself. The second area was comprised of the former bottom of the western and southern arms of Prairie Dog Bay (see Figure 1.). Because the local environmental conditions in those areas were deemed sufficient to protect any previously recorded or undiscovered cultural resources in them from impact, those two areas were not included in the present survey.

The initial phase of the survey consisted of a systematic and intensive pedestrian survey coupled with soil core testing. The purpose of intensive surface survey coupled with soil auger testing is to locate surface concentrations of cultural materials and to determine their relationship to the structure of the subsurface soil profile.

Because of differences in terrain and surface visibility around the lake shore, two separate methods were used to conduct systematic pedestrian surveys. The first method was used in places where large areas (up to ~350 acres) of gently sloping mudflats had been exposed in order to guarantee control of survey coverage and location, the area was gridded in parallel transects. First, by examining both density and size of vegetation cover and by locating old lake shorelines, the position and extent of the approximate 1940' msl elevation contour was located. An arbitrary datum was established at that elevation and transects were laid out ~50 m apart by pacing off intervals. These transect lines were extended approximately north-south and east-west, perpendicular wherever possible, and extended to the current lake shore. Rectilinearity of the grid was preserved wherever vegetation cover or terrain permitted. Bearings for the parallel and intersecting transect lines during the construction of grids were established using a Suunto KB-14 compass. Flagging pins were used to mark intersections on the grid.

As the grid was being constructed and flagged, soil auger tests were made along the transect lines whenever soil conditions, vegetation cover, and visibility permitted. Soil auger sampling was done with a standard 30 cm tube soil sampler with an 1.2 cm diameter. Soil auger tests were made to maximum penetrability. Soil auger tests were made along transect lines perpendicular to the shoreline (usually north-south) to establish

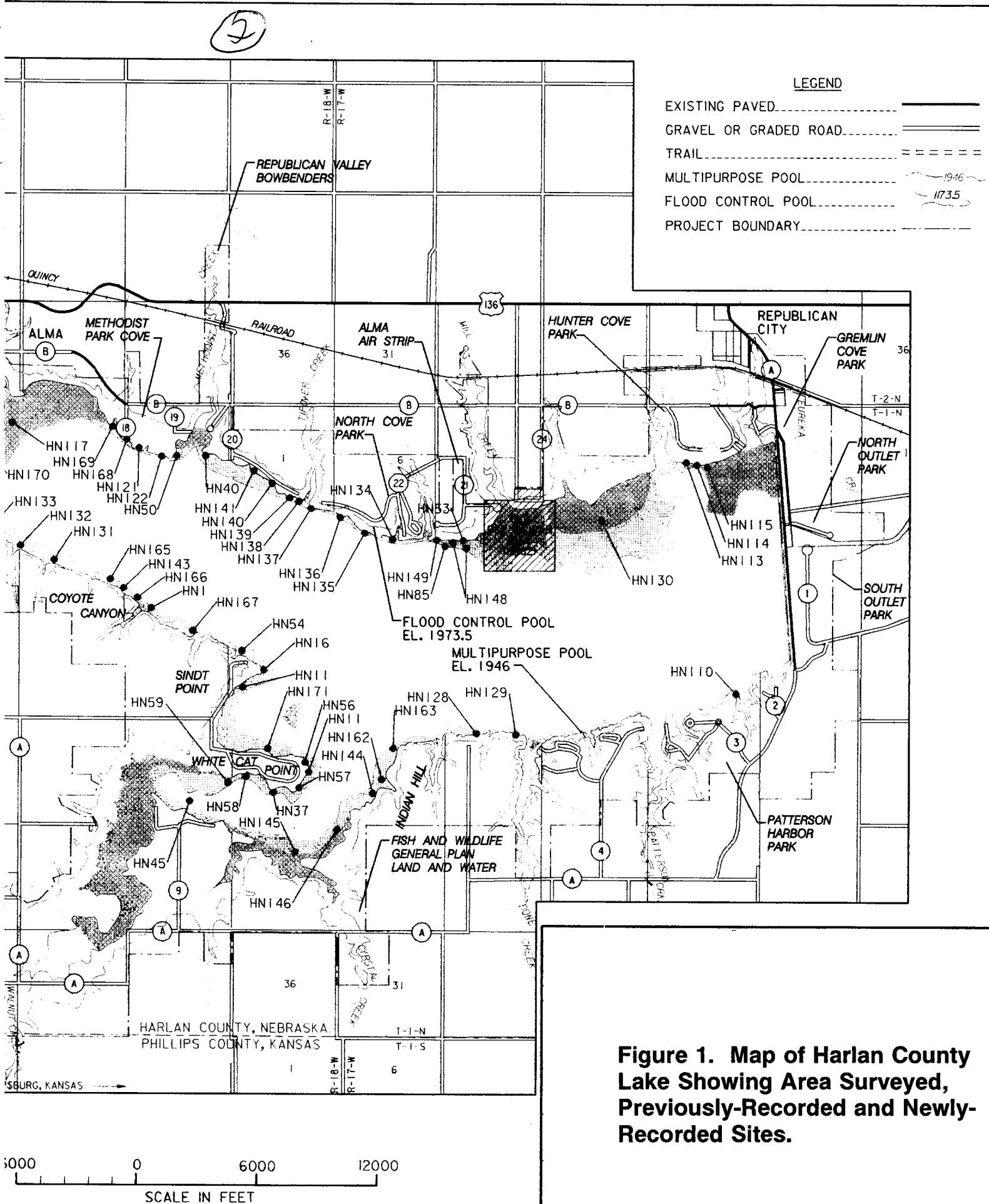
1



AREA SURVEYED

AREA EXCLUDED FROM SURVEY
BECAUSE OF VEGETATION AND SILTING IN

6000



3

LEGEND

EXISTING PAVED.....
GRAVEL OR GRADED ROAD.....
TRAIL.....
MULTIPURPOSE POOL.....
FLOOD CONTROL POOL.....
PROJECT BOUNDARY.....

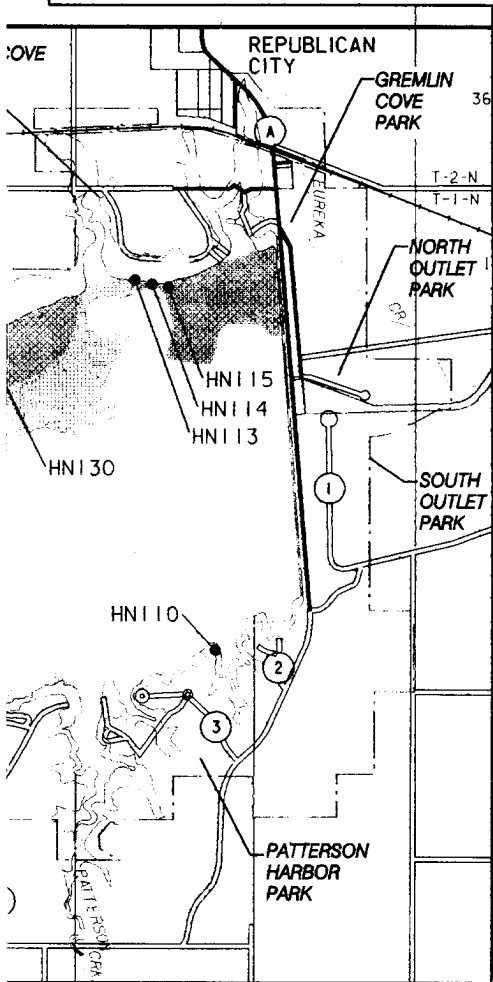


Figure 1. Map of Harlan County Lake Showing Area Surveyed, Previously-Recorded and Newly-Recorded Sites.

a subsurface profile from the 1940' msl elevation to the current shoreline. Soil auger tests were discontinued after a consistent general pattern of subsurface soil stratigraphy was developed (Figure 2.).

Surface survey was carried out along each transect line after soil augering was completed. As in the case of soil augering, surface survey was limited by terrain, vegetation cover and surface visibility. Visual inspection of the surface was carried out by walking the transect line during the soil augering and visually inspecting the surface in the 5 meters along either side of the line. When returning along the transect line the surface was visually inspected by walking a shallowly zig-zagging line extending 20-25 meters on either side of the transect line where vegetation permitted. This insured that a greater surface area could be inspected and also insured that the inspected areas would be close to overlapping, thus reducing the possibility of missing cultural materials during the walkover. During the visual inspection and pedestrian survey, artifacts were flagged and concentrations of artifacts mapped to determine density and source of deposition (Figure 2.).

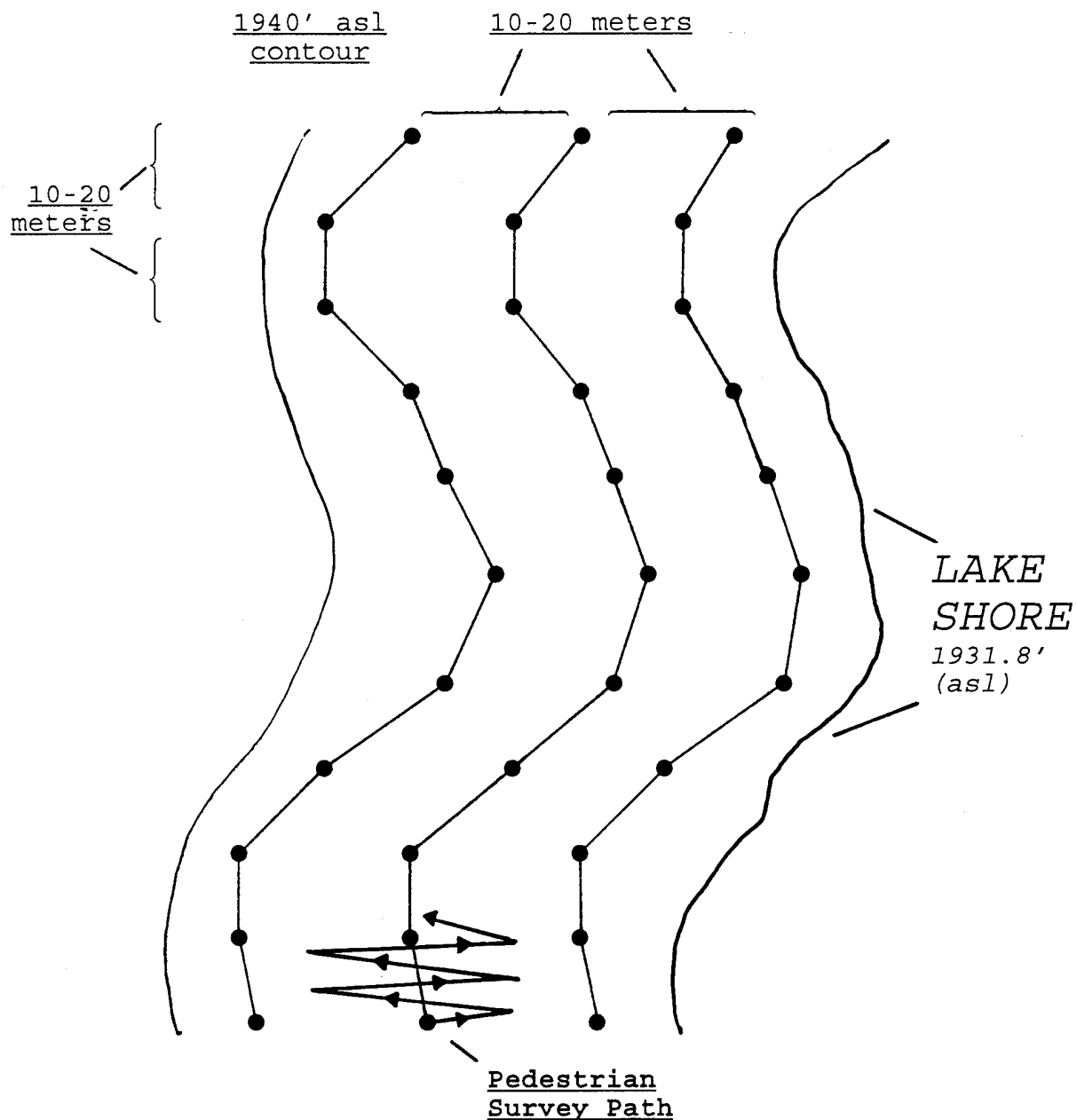
The second method of pedestrian survey was used in areas of steeper slope and where there was less distance from the 1940' msl elevation to the current shoreline. As in the method described above, it was first necessary to determine the approximate 1940' msl elevation by examining vegetation cover and locating former beach lines. The investigator then began the survey by walking as closely as possible to the current shoreline for an arbitrary distance (usually ~300 m) examining the exposed area of shore and the proximate 1-2 meters of inundated area whenever water clarity permitted. On reaching the end of the arbitrary distance, the surveyor paced off 5-10 m in from the shoreline toward the 1940' msl elevation wherever vegetation cover permitted and returned along the same distance parallel to the shoreline, walking a zig-zag line back and forth across the parallel to insure the greatest possible visual inspection of the area. This procedure was repeated as often as necessary until the parallel coincided with the 1940' msl elevation. As in the grid system, artifacts were flagged in order to determine density of scatter and origin of deposition (Figure 3.).

Based on conclusions drawn about the potential or identified locations of sites from the pedestrian survey and visual inspection coupled with soil auger testing, systematic shovel testing of specific areas or transects would be conducted. Depending on the surface density of sites, shovel tests would be conducted to assess subsurface contextual integrity at 10 m, 15 m, 30 m, or other intervals depending on site structure or landform configuration. Shovel tests were to be made with a bucket auger 20 cm deep and 15 cm in diameter. All shovel tests



Figure 3. -- Idealized diagram of a parallel survey transect system.

[Note: Pedestrian survey was done along all transect lines.]



would be screened through 1/4" steel mesh.

However, it was determined that many of the shoreline sites consisted of redeposited materials. This secondary deposition was caused either by: a.) downslope movement of materials by runoff and other forms of erosion, or b.) the gradual removal of the of fine particles of unconsolidated loess that constitute the local contextual matrix by runoff and wave action. Moreover, many of the shoreline areas had been heavily silted over by the redeposition of fine particles of the unconsolidated loess from beneath the lake and that cultural materials in those areas of shoreline were deeply buried (>1 m). Thus, in the case of redeposited artifacts, it was believed that contextual integrity was dubious in many cases. Minimal shovel testing confirmed this hypothesis, revealing that most of the concentrations along beach lines, unless being actively revealed by wave action erosion, consisted of smaller light and flat materials apparently being moved downslope to the shoreline by runoff erosion. Further, heavier materials, like hammerstones, large bifaces and spent cores, were found isolated upslope from lighter materials and often "pedestalled" in areas from which the matrix of unconsolidated loess had been removed by either gentle wave action or runoff erosion. Again, minimal shovel testing and soil augering confirmed the lack of contextual integrity in such areas. In areas of heavy silt deposition, soil augering and shovel testing yielded no artifacts. Therefore, extensive systematic shovel testing was performed in very few areas during the survey.

If drawdown continued past an elevation already surveyed, a second pedestrian survey with shovel testing where necessary was conducted.

Where necessary, lake shore site elevations were determined by measuring their vertical distance in feet above the lake level on the date the site elevation was measured. Measurements were made by stretching a line from a pin in the center of the site, perpendicular to the approximate tangent of the shoreline, to a levelled range pole at the lake's edge. Allowance of ± 0.2 feet was made to accommodate any line sag due to wind or other interference.

Because one of the goals of the survey was to assess erosional impacts on previously reported cultural resources in the Harlan County Lake area, part of the survey included the relocation and visual inspection of those previously identified sites to determine their condition and the kinds of impacts affecting them. The sites were relocated by consulting previous survey reports and site descriptions (e.g. Pepperl and Falk 1978, Roetzel 1982, Adair and Brown 1987). The investigator then visited the sites, wherever terrain or vegetation cover permitted, and visually inspected them. All impacts on the sites

were recorded and classified into erosional impact categories to aid in the monitoring, protection and/or conservation of those cultural resources.

CHAPTER FOUR

PREVIOUS FIELD INVESTIGATIONS AT HARLAN COUNTY LAKE

Although many local individuals had developed extensive private collections and Harlan County had been visited by Nebraska State Archeologist, E.E. Blackman, in 1907, systematic archaeological and historic property investigations in the Republican River Valley, and in the Harlan County Lake area in particular, began in 1930 when W.D. Strong, who had initially been excavating the Dooley site in neighboring Franklin County (25FR3), excavated 25HN5 and 25HN1, two burial sites (Blackman 1907, Strong 1933). Since that time nine additional field investigations have focused on the sites in and around Harlan County Lake, six of which were funded by the Kansas City District Corps of Engineers.

W.D. Strong's work for the Nebraska Archeological Survey in the Upper Republican River Basin consisted of reconnaissance survey and excavation of sites in Franklin and Harlan Counties. Using surface survey techniques and information from local inhabitants, he located and excavated the three sites noted above. From the information he recovered and from subsequent investigations by A.T. Hill at 25HN2 (Alma Ossuary) in 1931, Strong proposed that there was a Woodland Period component to occupations in the Upper Republican River Basin, now referred to as the Keith Focus of the Plains Woodland Period (Strong 1933). After the completion of Strong's report, there was a hiatus in archeological activity in Harlan County of nearly 13 years.

In 1946, as part of the Smithsonian Institution's River Basin Surveys, M.F. Kivett, J.M. Shippee and W. R. Wedel conducted an intensive survey and testing program in Harlan County. The area surveyed included the north side of the river valley from the town of Alma to Methodist Creek and from the confluence of Prairie Dog Creek and the Republican River southwest to Kansas Highway 383. Sites were located primarily by interviewing local informants. Twenty-three (23) sites were identified and tested: 16 occupation/habitation sites and 7 burials. Sites reported by previous investigators were also tested. Some of the sites (e.g. 25HN9 and 25HN12) reported during the survey were inundated with the flooding of Harlan County Lake in 1952; others currently lie outside of the boundaries of Corps of Engineers property (14PH4 [Woodruff Ossuary] and 14PH5) (Kivett 1947a,b, 1953, Wedel 1953).

Coinciding with the beginning of the construction of the Harlan County Dam by the U.S. Army Corps of Engineers in 1948, the University of Nebraska began an archeological field school in the Republican River Valley west of the proposed dam site. The proposed purpose of the field school was, in part, to locate, survey and excavate sites that might be damaged or destroyed by

the construction activities and the future inundation of the valley. Under the direction of John Champe, the field school carried out archeological investigations over four field seasons from 1948 to 1952. Field techniques included surface survey and collection, mapping, and excavation and recovery of cultural material. In the process, the University of Nebraska tested and excavated some previously reported sites (25HN9 and 25HN11) and located, reported and excavated several more, including 25HN37, White Cat Village, and 25HN44, containing the largest Upper Republican Earth Lodge ever recorded (Champe 1949, 1950a,b, Gunnerson 1960, Rusco 1960, Roll 1968).

With the filling of the Harlan County Lake in 1952, systematic archeological investigations in Harlan County ceased until 1972. At that time, the Corps of Engineers was considering a number of proposed improvements to the recreational facilities at the lake. In compliance with Federal antiquities legislation, C.R. Falk and T.D. Theissen of the Midwest Archeological Center, National Park Service, conducted an intensive survey and reappraisal of cultural resources at Harlan County Lake with a view to developing management and mitigation plans for areas to be impacted by the proposed improvements. Field techniques consisted of intensive reconnaissance survey and collection of cultural materials. From the data generated by the survey, a Master Plan for management and mitigation of the cultural resources at Harlan County Lake was derived (Pepperl and Falk 1979). An attempt was also made to generate a predictive model for settlement preference by prehistoric groups in the Upper Republican River Basin to aid in future cultural resource surveys (Falk and Theissen 1972, Pepperl and Falk 1978, 1979).

In 1979, the Corps of Engineers contracted with Impact Services Incorporated of Mankato, Minnesota, to conduct an intensive archeological survey and to test selected sites at Harlan County Lake for eligibility for inclusion in the National Register of Historic Places (NRHP) (Roetzel et al. 1982). During two field seasons (1979 and 1980), under the direction of R.A. Strachan, K.A. Roetzel and a team of investigators conducted an extensive survey of the entire exposed lake shore between the elevations of 1950 feet and lowest elevation of the lake during that period (1938.6 feet). Sixty-three (63) sites were identified during the survey phase of the investigation. In addition, 14 previously identified sites were tested for eligibility under NRHP guidelines. Roetzel's report (1982) indicated that at least 12 of the sites tested might be eligible for inclusion in the NRHP and she recommended that Harlan County Lake be considered as a National Historic District. She further indicated that many of the shoreline sites, both those previously identified and those located by her own survey, be monitored and, if threatened by erosional or other impacts, be mitigated. Roetzel also generated a settlement preference model to predict likely areas in which prehistoric sites might be located (Roetzel et al. 1982).

In 1982, Larson-Tibesar Associates of Laramie, Wyoming, analyzed burials from two sites (25HN118 and 25HN174) under contract to the Corps of Engineers. Their final report describes the remains, the associated material, and dates and ascribes a cultural affiliation for each (Tibesar et al. 1989). The remains have subsequently been reburied at Harlan County Lake (Larry Janicek, John P. Bailey, personal communication, 1992).

Also in 1982, in compliance with Federal antiquities legislation, the Corps of Engineers contracted Complete Archaeological Services of Cortez, Colorado, to inventory cultural resources in areas proposed for waterfowl habitat improvement and to investigate previously unsurveyed areas near Prairie Dog Bay (Watkins 1988). The principal investigator, Joe Watkins, intensively surveyed and tested those areas and located 6 sites and a number of isolated finds of cultural materials. Limited collections of cultural material were made. He also further developed the predictive models generated by previous investigators (Pepperl and Falk 1979, Roetzel et al. 1982, Watkins 1988).

As part of its continuing cultural resource inventory of the Harlan County Lake Project Area, in 1983 the Corps of Engineers contracted the American Resources Group, Ltd. of Carbondale, Illinois to survey federal land west of U.S. Highway 183 (Moore 1988). M.J. McNerny developed a stratified sample of the proposed project area and K.R. Moore surveyed and tested sites found in those areas. Limited collections were made from the sites and a more refined predictive model for prehistoric settlement patterns in the area was generated (Moore 1988).

The most recent archeological investigation of the sites at Harlan County Lake was a series of excavations conducted by Kaw Valley Engineering & Development, Inc., of Junction City, Kansas and Parkville, Missouri (Adair and Brown 1987, Adair 1988). Under the direction of M.J. Adair, excavations and data recovery were carried out by K.L. Brown on 28 selected sites to determine their eligibility for inclusion in the NRHP. Adair and her associates generated a report that analyzed lithic resources and exploitation, paleoenvironment and paleoecology, settlement and subsistence patterns in prehistory, and recommended four (4) sites for inclusion in the NRHP (Adair and Brown 1987, Adair 1989).

CHAPTER FIVE

ENVIRONMENTAL SETTING

Harlan County Lake is located in the southern half of Harlan County in south central Nebraska just north of the Kansas-Nebraska border. Harlan County Lake is a multipurpose facility that provides flood control in the Republican River Basin and to supply irrigation water to some 90,000 acres of land downstream from the dam. The Harlan County Lake project area occupies 30,260 acres of which 13,910 acres are inundated below the normal pool level (1946 feet msl). The remaining 16,350 acres are devoted to agriculture, recreation, and wildlife management.

Hydrology

Harlan County Lake is located in the Republican River Drainage in the Great Plains physiographic province in an area of dissected loess plains. The Republican River Drainage in the Harlan County area includes the Republican River and its major tributaries, the Beaver, Sappa, and Prairie Dog Creeks as well as smaller ephemeral tributaries such as Methodist, Flag, and Patterson Creeks. The Republican River is part of the Missouri River system and joins the Kansas (Kaw) River near Junction City, Kansas which then joins the Missouri River near Kansas City (Pepperl and Falk 1979, Mitchell et al. 1974, Wedel 1986).

The Republican River is one of the few rivers in the plains that is not fed primarily by snow melt runoff from the Rocky Mountains, but is instead fed by perennial springs. This constant source of supply permits the Republican to flow even during periods of low precipitation and extreme drought. This characteristic, which affects the entire Republican River Basin, undoubtedly influenced prehistoric people who chose the area for settlement (Wedel 1986). The Harlan County area is particularly significant in that it contains the confluence of three of the major tributaries of the Republican River and would thus be an ideal location for settlement because of the abundance of water available. It would thus be attractive to people and wild game as well as supporting a large variety of flora.

Geology and Soils

Three major landforms are observable in the Harlan County landscape: uplands, riverine terraces, and alluvial bottomlands. In a previous survey report, Moore (1988) calculated that 45% of the land in the Harlan County Lake project area contained upland environments, 31% was riverine terrace, and 24% was floodplain bottomland. Because of bank cutting and shearing around the lake shore, many of the underlying geological and pedological strata are exposed.

Five lithologically distinct geologic units are exposed in the Harlan County Lake area. The oldest, the Niobrara Formation, consists of a chalky, shaley Cretaceous limestone (Pepperl and Falk 1979, Adair and Brown 1987, Moore 1988). It is clearly visible in the bluffs bordering the south shore near the western end of the lake. The Niobrara Formation served as the main source for lithic materials used by local populations in prehistory. In particular, it is well documented that Republican River jasper/chert (also called Niobrara), which ranges in color from yellow to brown to dark red and is often banded, was the primary source of lithic tools in the area (Adair and Brown 1987, Moore 1988, Wedel 1986, Strong 1933). In 1904, in the nearby town of Norton, Kansas, historic American populations were mining gem-quality Niobrara jasper from a quarry identified as having been a prehistorically used lithic source by W.D. Strong (Wedel 1986). Dr. Robert Bozell has also described a small quarry site north of the town of Orleans in Harlan County (personal communication 1992).

Above the Niobrara Formation, but also of Cretaceous age is the Pierre Shale Formation which consists of a marine, carbonaceous, limy shale (Pepperl and Falk 1979, Adair and Brown 1987, Moore 1988). It is believed that layers of calcite crystals that occur in the Pierre shales may have been used as a source of the calcite temper found in Woodland Period pottery found in the Harlan County area (Kivett 1952, Wedel 1986).

Overlying the Pierre shales is the Ogllala Formation (or Group) of fluvial sandstones in which occur lenses of gravel, silt, and clay of Tertiary age (Pepperl and Falk 1979, Adair and Brown 1987, Moore 1988). Moore, citing Miller (1964), observes that the green coarse-grained feldspathic chert (or quartzite) occasionally used by prehistoric groups in the area for lithic manufacture probably comes from the Ogllala beds (Moore 1988).

Above the Ogllala Formation are Pleistocene fluvial sands and gravels (Pepperl and Falk 1979, Adair and Brown 1987, Moore 1988, Martin 1991).

On those Pleistocene gravels and sands, the Peoria Loess was deposited (Pepperl and Falk 1979, Adair and Brown 1987, Moore 1988, Martin 1991). The deposition of the Peoria Loess in the Harlan County area began circa 26,200 bp (before present) and continued to about 13,000 bp (Martin 1991). This period of deposition was followed by a 2,000 year period of entrenchment and reworking of the Peoria loess and the development of a soil horizon. The paleosol that defines the ancient surface of the Peoria loess is visible in many of the bluff faces around Harlan County Lake and has been dated by radiocarbon assay to between 26,260 \pm 680 bp and 10,360 \pm 130 bp (Martin 1991).

The paleosol that developed on the Peoria Loess was buried

beneath the deposition of the Bignell Loess after 10,200 bp. The Bignell depositional episode lasted approximately 2,000 years, ending around 8,000 bp (Martin 1991). However, alluviation continued in the Republican River Valley and deposition of fine silts, sands, and reworked loess persisted until ~4,500 bp in the Holocene. After this period of deposition, a new soil surface developed (Martin 1991). The paleosol that makes up the surface of the Bignell Loess is also visible in many of the eroded bluff faces at Harlan County Lake.

Since 4,000 years ago, the Republican River has become more entrenched in the valley and the local creek beds have become more incised. Fluctuations in local and regional climate have affected the development of soil horizons in Harlan County. The upland area soils during this period have been characterized by stability while soils on the valley floor have been alternately stable or gone through periods of floodplain silt, sand, and loess deposition (Martin 1991, see also May 1992, May and Holen 1985). Several distinct paleosols that developed between 3,000 and 2,700 bp, 2,700 bp and 2,000 bp, and since 2,000 bp are visible in the bluff faces on the southern shore of the lake (Martin 1991). In one area, the most recent deposition of loess from the "Dustbowl" of the 1930's is visible. (see Table 1.).

There are three major soil associations in the Harlan County Lake Project area: the Holdrege-Coly-Uly association, the Hord-Cozad-Hall association, and the McCook-Munjoy-Inavale association (Mitchell et al. 1974). The Holdrege-Coly-Uly association includes most of the upland soils and the highest terraces of the creek and river drainages. They are represented in the project area primarily by Uly and Coly series soils on the bluffs bordering the south shore of the lake, although they can be found in the uplands of the northern part of the project area (Mitchell et al. 1974). Because these soils are in the most part founded on well-drained but unconsolidated Peoria loess they are subject to intense runoff and rill erosion (Moore 1988, Mitchell et al. 1974).

The Hord-Cozad-Hall association makes up the soils of the contemporary river terraces and some of the bottomland soils (Mitchell et al. 1974). Hord and Hall silt loams dominate the gently sloping areas close to the lake. They are more consolidated than upland soils, although when not covered by vegetation, because of their loess parent material, they are also subject to extreme runoff and rill erosion. Because of the gentle slopes that characterize the Hord and Hall soils, areas in which they are likely to occur are also ideal areas for habitation or agricultural sites (Mitchell et al. 1974, Moore 1988). Many of the prehistoric sites located by previous surveys in the Harlan County Lake area are found in Hord and Hall soils (Gunnerson 1960, Roetzel et al. 1982, Adair and Brown 1987, Tibesar et al.

Table 1. -- Geologic Chronology, Harlan County, Nebraska.

Geologic Chronology of Harlan County Lake Area
30,000 bp to the Present
(after Martin 1991)

30,000 - 26,000 bp	Deposition
26,000 bp	Soil Formation
26,000 - 13,000 bp	Deposition
13,000 bp	River Incision
13,000 - 11,500 bp	Slow Deposition
11,500 - 10,200 bp	Soil Formation
10,200 - 4,500 bp	Deposition
4,500 - 3,700 bp	Deposition
Post-3,700 bp	River Incision
3,700 - 3,000 bp	Soil Formation
3,000 - 2,700 bp	Deposition
2,700 bp	Soil Formation
2,700 - 2,000 bp	Deposition
2,000 bp	Soil Formation
2,000 - 1,200 bp	Deposition
Post-1,200 bp	River Incision
Historic	Deposition

1988, Moore 1988).

The McCook-Munjor-Inavale soils are found in the bottomlands of the Republican River valley floodplain. They are loams that range from "loamy fine sand" (Munjor) to "fine sandy loam" (Inavale) (Mitchell et al. 1974). These soils are only represented in the Harlan County Lake project area in areas not directly bordering the lake, such as the bottom land soils below the dam itself and lands west of the U.S. Highway 183 bridge over the Republican River at the western end of the lake. Archeological sites are seldom found in bottomland areas because of riverine silt deposition burying them or river channeling and scouring of bottomland terraces removing or reconfiguring sites. Although there have been very few archeological sites located by previous surveys in the bottom land areas of Harlan County, it remains possible that such sites may have been buried under riverine silts. Gunnerson and others have remarked that some Upper Republican sites in Harlan County were located near the Republican River (most notably 25HN44) and that Woodland period sites tend to be located on river margins (Gunnerson, personal communication 1992, Kivett 1952, Roll 1968). It should also be noted that bottomlands are by far the most fertile and well-watered areas of the valley and are therefore ideal locations for agricultural field systems both in prehistory and in modern times. Therefore, river activity in the bottom land areas does not preclude the existence of buried cultural resources in those areas.

Because the current survey concentrated on the lake shore where wave action and rill and runoff erosion had acted on the local soils and subsoils, most of the surface organic material that composed the local soils (the "A" horizon), had been removed by erosional processes.

Climate

The climate in Harlan County is typical of a region located in the central part of a continent at its northern latitude. The summers are generally hot and dry and the winters relatively cold. Precipitation is characterized as moderate (~20" per year) but highly variable from day to day, season to season, and year to year (Mitchell 1974). This unpredictability of weather pattern is partly due to the fact that the major continental air masses meet over the Central Plains. Harlan County lies beneath the ever-shifting borders of those air masses. Most of the moisture that is precipitated on the region comes from the warm and moist Maritime Tropical air mass generated by the Gulf of Mexico, but the region also receives moisture from the northern Mild Pacific air mass. Moreover, south central Nebraska is subject to the drying effects of westerly winds from the Rocky Mountains and northerly winds from the Arctic (Adair and Brown 1987). Thus, the wind and weather patterns over the Harlan County area can shift

dramatically from day to day and can range from locally heavy thunderstorm downpours to extremely dry desiccating winds.

Flora and Fauna

Because of its geomorphology and climate, Harlan County can be divided into two generalized ecological zones: the upland mixed grass prairie and the lowland riverine wooded zones. As its classification suggests the upland mixed grass prairie consists of a mixture of plants from both tall grass and short grass prairie environments (Bare 1979, Farrar 1990, Nebraska Department of Agriculture 1979, Weaver 1968, Wedel 1986). In general, drought tolerant species dominate the tops of hills and slopes while species preferring more moist conditions populate the lower slopes of the hillsides. Dominant grasses in the prairie environment are: little bluestem (Andropogon scoparius), big bluestem (Andropogon gerardi), side-oats grama (Bouteloua curtipendula), blue grama (Bouteloua gracilis), Indian grass (Sorghastrum nutans), and buffalo grass (Buchloe dactyloides). Forbs in the mixed grass prairie environment include: sunflower (Helianthus annuus), Jerusalem artichoke (Helianthus tuberosus), coneflowers (Petalostemon spp.), yarrow (Achillea millefolium), false boneset (Kuhnia eupatorioides), various other members of the Compositae (cf. Aster ericoides); legumes such as Indian (or prairie) turnip (Psoralea esculenta) and lead plant (Amorpha canescens); and other weedy species like snow-on-the-mountain (Euphorbia marginata) and cattail (Typha angustifolia) (Bare 1979, Farrar 1990, Nebraska Department of Agriculture 1979, Phillips Petroleum Company 1963, Weaver 1968, Wedel 1986).

A number of woody plant species populate the bottoms and creek beds in the area. The primary woody plant species are: cottonwood (Populus deltoides), black locust (Robinia pseudoacacia), box elder (Acer negundo), hackberry (Celtis occidentalis), elm (Ulmus americanus), and black walnut (Juglans nigra) (Adair and Brown 1987, Weaver 1968, Wedel 1986).

Indigenous food plants from the plains environment included sunflower, Jerusalem artichoke, bush morning glory (Ipomoea leptophylla), cattail, Indian turnip, groundplum milkvetch (Astragalus crassicaucus), purple poppymallow (Callirhoe involucrata), and arrowhead (Sagittaria latifolia). It is believed that at least sunflower and marshelder (Iva annua) were cultivated by the prehistoric occupants of Harlan County along with maize (Zea mays), beans (Phaseolus sp.), and squash (Cucurbita spp.) (Adair and Brown 1987, Wedel 1986).

The local plant community and its associated riverine environment provide an excellent habitat for game and fish, many of which would have been exploited by prehistoric Native Americans in the upper Republican River Valley. Large game animals populating the area included buffalo (Bison bison) and

mule deer (Odocoileus hemionus) which were exploited for meat and hides for local consumption and also for trade (Wedel 1986, Adair and Brown 1987). Other mammalian species of economic importance include the pronghorn antelope (Antilocapra americana), black bear (Ursus americanus), bobcat (Lynx rufus), coyote (Canis latrans), badger (Taxidea taxus), beaver (Castor canadensis), raccoon (Procyon lotor), mink (Mustela vison), prairie dog (Cynomys ludovicianus), and black-footed ferret (Mustela nigripes) (Wedel 1986, Adair and Brown 1987).

Harlan County Lake is also on a major migratory fly way for game birds, including Canada geese (Branta canadensis), snow geese (Anser c. caerulescens), mallard duck (Anas platyrhynchos), and northern pintail duck (Anas acuta). Other game birds native to the area are wild turkey (Meleagris gallopavo), blue and sharp-tailed grouse (Pediacetes spp.), and prairie chicken (Tympanuchus cupido). (Bellrose 1976, Wedel 1986, Adair and Brown 1987). Remains of avian fauna have also been recovered at Harlan County Lake (Gunnerson 1960, Kivett 1952, Adair and Brown 1987).

Adair and Brown (1987) remark that fishes, reptiles and amphibians appear not "to have figured significantly in the diet of the prehistoric and historic Indians of the Central Plains (p.21)". Gunnerson (1960) points out that the Apachean groups that still survive have a taboo against fish, which would explain the absence of fish from the Dismal River Aspect sites in Harlan County. However, the recovery of fishing implements from Upper Republican sites in the area, as evinced by examples in the Prettyman collection in Alma, indicates that there was at least some focus on obtaining fish in the prehistoric economy. Moreover, the recovery of fish spines during the current survey that appear to have use-polish and were perhaps used as awls or needles further supports the belief that prehistoric Native Americans were exploiting local fish resources. It is also possible that earlier surveys and excavations in the Harlan County Lake area did not possess recovery methods adequate for the small bones of fish. Local species of fish that might have been available to prehistoric cultures include: catfishes (Ictalurus spp.), flathead catfish (Pylodictis olivaris), white bass (Monroa chrysops), various sunfishes (Leptomis spp.) and crappie (Pomoxis spp.) (Morris et al 1972, Wedel 1986).

Given the generally mild climate and the availability of perennial fresh water and abundant game, the Harlan County Lake area provided an ideal setting for prehistoric settlement.

CHAPTER SIX

CULTURAL HISTORY

Before discussing the cultural history of the Upper Republican River Basin and, in particular, the cultural sequence of human occupation in the Harlan County Lake area, it should be noted that the archeological record of people living in the Great Plains is discontinuous both in time and space. This discontinuity is partly due to the vastness of the territory, but it is also due to a lack of consistent interest and effort in the systematic archeological investigation of the area. While there has always been a handful of archeologists who have formed a core of investigators focusing on the Plains area, interest by other agencies in and, hence, funding for Plains archeological research has waxed and waned several times since the beginning of the twentieth century. With the passage of Federal antiquities legislation and the expansion of Cultural Resource Management services, however, the archeological database from which inferences about the cultural history of the Plains are drawn has expanded. As a result, our understanding of the sequence of events that makes up the prehistory of the Great Plains, and in particular the Upper Republican River Basin, while still incomplete, continues to improve.

Because the water in the Republican River is primarily provided by perennial spring-fed creeks, the river is and has been one of the only constant sources of water in the Central Plains throughout history and prehistory. The basin itself is well watered even in times of drought and provides excellent habitat for large and small mammals, wildfowl, and fish (see "Environmental Setting: Flora and Fauna" above). It is not surprising, therefore, that people have also chosen the Upper Republican River Basin for settlement. Currently, the chronology of human occupation is divided into the following five major periods (Table 2.).¹

The Paleoindian Period (11,000 bp - 6,500 bp)

Although arguments persist for earlier human occupation of the Central Midwest, the Paleoindian Period is currently the earliest archeologically confirmed human presence in the Central Plains (Meltzer 1989, Gunnerson 1987, Grange 1980, Frison 1978). Paleoindian people are believed to have been highly mobile hunter-gatherers who intensively exploited the late Pleistocene megafauna, particularly mastodon (Mammut americanum), mammoth

¹ All dates for prehistoric periods are **before present (bp)**. For clarity, dates after European Contact (AD 1492) are rendered according to the Gregorian calendar (**AD**).

(Mammot jeffersonii), and extinct bison (Bison antiquus) (Frison 1978, Saunders 1983). Paleoindian sites have generally been discovered in areas where such game would have congregated in the late Pleistocene (Frison 1978, Gunnerson 1987). In Nebraska, such sites are usually found associated with the surface of the Peoria loess which has been buried by eolian and pluvial soil aggradation processes (Grange 1980, Martin 1991) (see "Environmental Setting: Geology and Soils" above). As a result, most Paleoindian sites are deeply buried and, until recently, have been discovered primarily by their accidental exposure (Frison 1978).

Evidence from earlier archeological investigations of the Harlan County Lake and artifacts recovered from Harlan County by local museums and private collectors indicate that human occupation of the Upper Republican River Basin may have begun as early as 11,000 years ago. Berkeley Bailey, an archeologist with the Corps of Engineers, Kansas City District, David Klostermeier, Park Officer at the First State Capitol Historic Site, St. Charles, Missouri (an expert on lithic technology and reproduction), and the head of this survey project have observed both Clovis and Folsom lithics in the private collection of Paul Prettyman, whose collection is almost exclusively derived from the Harlan County area. Roetzel has suggested that sites 25HN57, 25HN110, and 25HN138 may have Paleoindian components (Roetzel et al. 1982). Adair and Brown's testing of site 25HN164 also suggested that there has been Paleoindian occupation (Adair 1988). Further, the recovery of mammoth bones and tusks and the bones of extinct bison (Bison antiquus) from the shore of the lake indicate that the resources exploited by Paleoindians were available in the area. During the current survey, some mammoth bones have been found associated with flakes and scrapers, although the poor context of their association does not permit the conclusion that the find is actually a "kill" site (see "Results" below). Nevertheless, evidence from sites in nearby counties in Nebraska suggests that there is a high probability for their having been a Paleoindian occupation in Harlan County (Davis 1962, Grange 1980). Moreover, because bank erosion along the lake shore has exposed surfaces and cutbanks in the Peoria loess in which Paleoindian sites are often found, it is more than likely that such sites will be discovered in the future at Harlan County Lake (Gunnerson 1987, Davis 1962, Frison 1978).

The Plains Archaic Period (6,500 bp - 2000 bp)

The Plains Archaic period is usually defined as a shift in the focus of the hunter-gatherers of the Plains from exploitation of large mammals to smaller ones, specifically a shift in focus from bison (Bison spp.) to species like pronghorn antelope (Antilocapra americana) and mule deer (Odocoileus hemionus). The shift in resource focus is usually ascribed to the extinction of the megafauna (see above) and a dramatic climatic shift from the

cool, wet climate of the late Pleistocene to a much drier and hotter climate in the early Holocene. This early period of hot, dry climate is generally referred to as the Altithermal, during which time mean annual temperatures rose to be as much as 5°C above current means and stronger westerly winds extended the rain shadow from the Rocky Mountains much farther east (Gunnerson 1987, Wedel 1953, 1986, Bamforth 1988). This climate shift altered the composition of the prairie grasslands in the Central Plains, favoring smaller animals requiring less water and poorer forage than those of the late Pleistocene (Weaver 1968, Wedel 1986, Gunnerson 1987, Bamforth 1988). Until recently, it was assumed that the climate was so harsh as to have discouraged human occupation of the Central Plains (Frison 1978, Bamforth 1988). However recent investigations have demonstrated that rivers fed by perennial springs might well have served as a focus for Archaic peoples' subsistence. These studies also indicate that Archaic groups might more intensely occupy these more amenable environments on a seasonal basis, finding them to be better hunting and gathering areas (Grange 1980, Bamforth 1988, Wedel 1987). The Upper Republican River Basin might well have been such a focal area.

Central Plains Archaic sites are characterized by house features representing semi-permanent seasonal occupation, hearths, stone tools and lithic debris, worked bone, and some ground stone artifacts. Although there is an extensive Archaic component to occupations in nearby Frontier County (25FT31) (Grange 1980), as of the current survey no intact Archaic site has been found by any investigation of the Harlan County Lake area. Roetzel has identified an Archaic component to site 25HN146 based on basal fragments of projectile points (Roetzel et al. 1982) and, during the course of this investigation, there have been several isolated finds of projectile points and scrapers of Archaic form. There is also a significant representation of Archaic materials in the Prettyman collection (see above).

It is not unusual that Archaic sites should not be readily apparent, however. Recent pedological and geomorphological studies by C.W. Martin (1991) in Harlan County and work by Mandel on the Smoky Hill and Pawnee Rivers in Kansas (Mandel 1992) indicated that, during the Altithermal, river channeling and terracing would have been accelerated by the drying of the unconsolidated loessial soils, facilitating the removal of those soils from the banks and slopes bordering the river by excision or pluvial processes. It is presumed that Archaic groups would have selected sites above the floodplain, on the first and second river terraces, in order to be near sources of water and game habitats and to be above areas of potential flood. Since the Archaic Period, there have been several episodes of river channelization, increased soil excision and aggradation, and intermittent flooding in and along the Republican River Drainage (Martin 1991). As a result of these processes, one would expect

Archaic sites to have been either buried under soils aggrading onto old river terraces or to have been scoured by flood waters cutting through the valley. Both processes would reduced the likelihood of finding such sites during archeological surveys. As is the case with Paleoindian sites at Harlan County Lake, there is a greater potential than might otherwise be expected for discovering remnants of Archaic sites because of the erosion of cutbanks and soil surfaces along the shore of the lake.

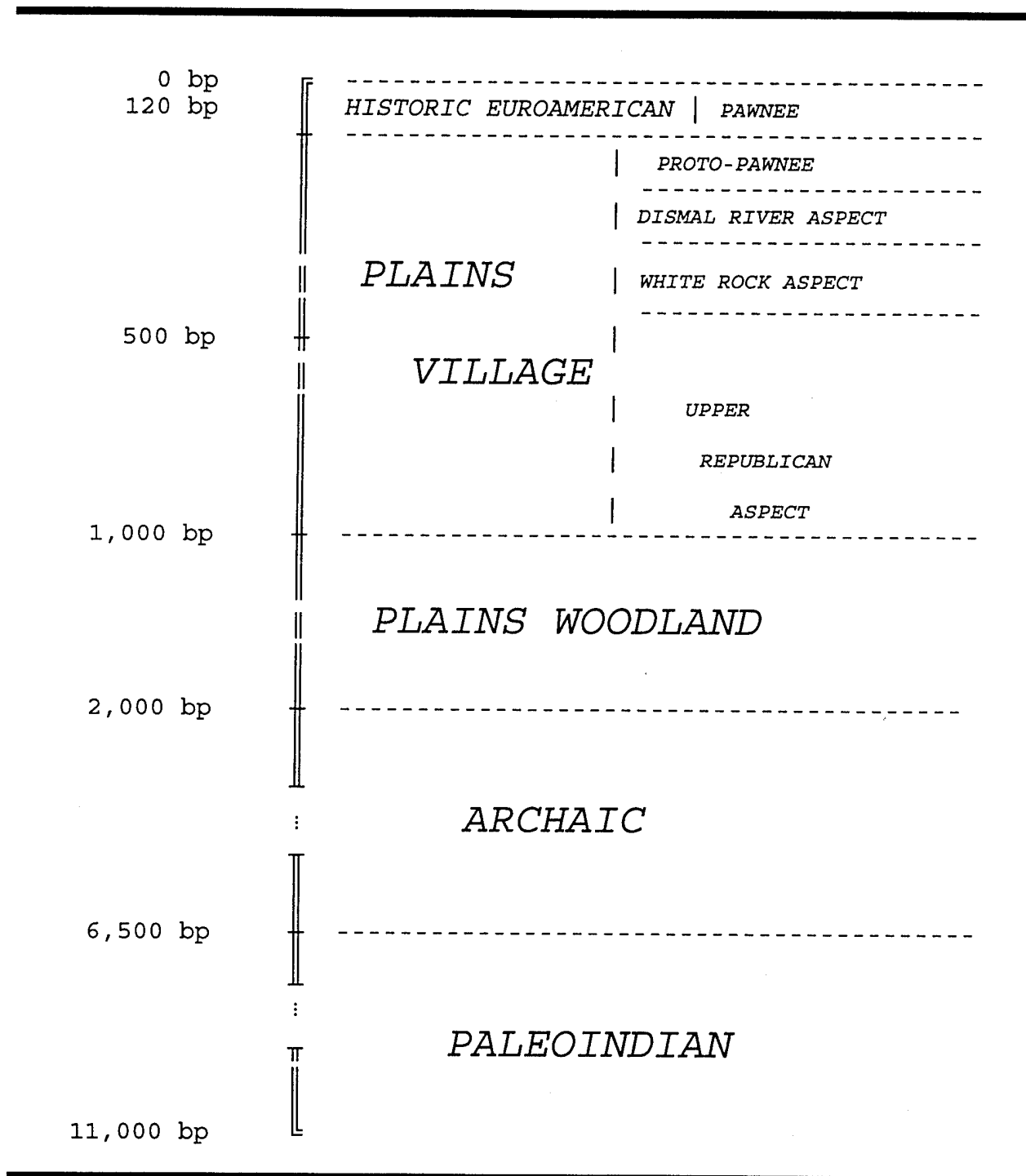
The Plains Woodland Period (2,000 bp - 1,000 bp)

The end of the Archaic Period in the Central Plains and the transition to the Plains Woodland Period is recognizable in the pedological, paleoclimatic, and paleoecological record by an increase in rainfall, a reduction in the strength of the westerlies, and an increase in the presence of cooler and wetter climate species of flora and fauna (Martin 1991, Wedel 1986, Adair 1987, Bamforth 1988). Since that change, Holocene climate on the Central Plains has remained fairly stable (Weaver 1968, Martin 1991, Adair and Brown 1987, Bamforth 1988). The moderation and stabilization of the physical environment and the concomitant expansion of the available resource base brought changes in the structure and adaptation of human populations in the Central Plains.

Plains Woodland groups are often characterized as hunter-gatherers who developed a supplemental horticultural economy toward the end of their cultural ascendancy (Kivett 1952, Wedel 1986). However, their habitation sites and the appearance in their culture of an established ritual component coupled with circumscribed cemetery areas (often termed "ossuaries" in the early literature), suggests that Plains Woodland sites were occupied for longer periods of time than those of previous Plains groups although their shelters are considered to have been designed for temporary occupations by nuclear or small extended families. On the other hand, the size of Plains Woodland settlements suggests a general trend toward population increase (Kivett 1952, Wedel 1986).

Plains Woodland habitation sites are generally found along the edges of smaller feeder creeks in the Upper Republican River Basin. It is believed that this preference was reinforced by the general turbidity of the Republican River and, hence, its poor water quality, and its tendency to flood. Even so, previous comparative statistical studies performed on settlement data from Harlan County, Frontier County, and Red Willow County in Nebraska and Phillips County in Kansas indicate that Plains Woodland groups tended to settle at lower elevations than people of other

Table 2. -- General Chronology of Human Occupation in the Upper Republican River Valley. (all dates "before present" [bp])



periods (Pepperl and Falk 1979, Grange 1980, Roetzel et al. 1982, Watkins 1988, Moore et al. 1988, James H. Gunnerson, personal communication, 1992). The earliest burials in the hilltop "ossuaries" identified in the Harlan County Lake area are of Plains Woodland affiliation and Strong and Kivett used the similarity of manufacture of mussel shell beads and other artifacts included in those burials to other burial sites along the Upper Republican River Basin to define the Keith Focus of the Plains Woodland Period (Strong 1933, Kivett 1952). Plains Woodland burials are not restricted to these cemeteries, however, and several in-house burials were recovered during Kivett's initial work in the Harlan County area (Kivett 1947a,b, 1952).

Aside from shell-bead burials, Plains Woodland sites in the Harlan County area can be recognized by the appearance of thick, calcite tempered pottery. These vessels are generally narrow, with rounded bases and flared rims, decorated with cord-roughening on the exterior surfaces, termed "Harlan Cord-Roughened Ware". Paste varies from dark gray to black and often appears to contain air-pockets. These pockets are, in fact, usually the result of post-depositional processes dissolving and then leaching the calcite temper out of the sherds (Kivett 1952, Grange 1980). Harlan Cord-Roughened Ware is the earliest known example of pottery in the Upper Republican River Basin.

Most of the Plains Woodland sites in the Harlan County Lake area were recorded before 1952 by Strong (1933), Kivett (1947a,b), and Champe (1950). However, Roetzel (1982) has attributed sites 25HN130 and 25HN145 to the Plains Woodland Period. No artifacts or sites of clearly Plains Woodland affiliation were identified during the current survey. This may be due, in part, to their being located on lower river terraces and thus having been inundated by the flooding of Harlan County Lake, if the settlement pattern statistics hold to be true (Pepperl and Falk 1979, Roetzel et al. 1982, Moore 1988, Watkins 1988). On the other hand, such lower elevation sites would have been exposed to the intermittent floods that have scoured the Republican River Valley in the past, and thus destroyed. Other Plains Woodland sites located at low elevations would very likely have been inundated and silted over during floods and thus be deeply buried under floodplain silts. Further, if Plains Woodland sites are most likely to be located between elevations of 1925 and 1940 feet msl, it would place them in the zone of highest potential erosion along the current fluctuating lake shore. Many sites would potentially, therefore, have been lost to various erosional processes.

The Plains Village Period (1,000 bp - 120 bp [AD 1872])

The Plains Village Period occupations of the Upper Republican River Basin are well represented in the Harlan County Lake area. Plains Village sites are easily recognizable by the

presence of large habitation sites, extensive middens, cache and roasting pits, sand and grit tempered pottery, bone and stone agricultural and plant-processing implements, and permanent and semi-permanent house structures (Wedel 1986, Gunnerson 1987). Although hunting and gathering continued to be an essential part of Plains Village life, the introduction of crop plants like maize (Zea mays) and squash (Cucurbita spp.) at the beginning of the period eventually led to the development of an agricultural component to the subsistence pattern of Plains Village groups (Wedel 1986, Gunnerson 1960, 1988). Plains Village settlements, like Plains Woodland settlements, are concentrated along the perennial creeks that feed the Upper Republican River, but at higher elevations (~1930' - 1980' msl). Most settlements are located in the transitional ecotone between the high bluffs and the creek terraces.

Five distinct cultural groups have occupied the Harlan County area. Each culture possessed different pottery styles and house forms and can be recognized stratigraphically as occupying discrete temporal periods. The three earlier occupations -- the Upper Republican Aspect (1,000 bp - 600 bp), the White Rock Aspect (AD 1500-1600), the Dismal River Aspect (AD 1600 - circa AD 1725) -- have been the most intensively recovered and studied in the Harlan County area (Champe 1950, Wedel 1986, Gunnerson 1960, 1987, Rusco 1960, Roll 1968). The two later groups, the Proto-Pawnee and the Historic Pawnee, although possessing distinct material cultures, are more regarded as being immigrant and representing a gradual cultural evolution in adaptation to the Plains environment and are therefore often lumped into a single time period beginning with the entrance of those cultures into the Central Plains and ending with the establishment of permanent Euroamerican settlements in the area (~AD 1775 - 1872) (Grange 1968, Wedel 1986, Gunnerson 1987).

The Upper Republican Aspect (1,000 bp - 600 bp)

The Upper Republican Aspect is the most extensively represented cultural group in the archeological literature dealing with the Harlan County Lake area. Upper Republican sites have been identified by every survey and/or testing project in the valley (Champe 1950, Gunnerson 1960, Pepperl and Falk 1979, Roetzel 1982, Adair and Brown 1987, Watkins 1988, Moore 1988). This is undoubtedly the result of several factors. For example, there is no doubt that the Upper Republican people densely occupied the valley for a longer period of time than any of the later groups (some 400 years). Moreover, the Upper Republican settlements are, by and large, greater in size than later settlements, with the possible exception of the Pawnee. Because of the greater size of Upper Republican settlements, it is more likely that a portion of an Upper Republican site would be encountered during a reconnaissance survey than a portion of a site from any other period.

Further, recovery of Upper Republican material is much more likely around Harlan County Lake because of the 15 creeks that feed into the lake and the Republican River in the project area. Because the Upper Republican people preferred to locate their settlements alongside and near the confluence of such creeks, one would expect a greater number of sites to be located in an area like Harlan County than in an area containing fewer creeks. Furthermore, since most of the archeological surveys in South Central Nebraska have been tied to Bureau of Reclamation or Corps of Engineers projects surrounding lakes formed by damming areas of confluence of creeks and rivers, one could reasonably expect a resultant numerical bias in favor of the recording of Upper Republican sites at Harlan County.

The diagnostic features of the Upper Republican Aspect occupations recovered from the Harlan County Lake area have been remnants of large rectangular semi-subterranean earth-covered lodges and their associated storage pits and hearths. In Harlan County, these lodges reached a maximum size of 12x20 m. The main diagnostic artifacts consist of sherds of Upper Republican pottery, which is generally sand and grit tempered, characterized by round bottoms and heavy, bevelled and, sometimes, braced rims. The pots are usually cord-roughened for decoration and sometimes the rims bear incised linear decorative motifs. Paste varies from gray to black, although many of the body sherds show signs of the exterior surface having been "puddled" to bring out a more uniform surface of light brown color. Representative Upper Republican sites identified by previous surveys include 25HN11, 25HN55, 25HN134-137, 25HN139 and 25HN173. During the current survey it became apparent that sites 25HN134-137 and 25HN139 were more extensive than thought by previous investigators.

The White Rock Aspect (AD 1500-1600)

The Blue Stone Focus of the White Rock Aspect was identified in Harlan County by Rusco's analysis of materials recovered by the University of Nebraska field school seasons of 1948-52 (Rusco 1960). House structures of the White Rock Aspect are round or nearly rectangular (with rounded corners), semi-subterranean earth-covered lodges. They are smaller than Upper Republican house structures and appear to have housed smaller nuclear or extended families than the earlier Upper Republican homes and are located at lower elevations than Upper Republican sites. Pottery is sand and grit tempered, of gray to black paste, and characterized by Walnut Decorated Lip, which includes both finger and tool impressed designs. The White Rock settlement of the Harlan County Lake area appears to have been focused on the banks of Prairie Dog Creek (25HN39 and 25HN45). In her interpretation of 25HN39 (Green Plum) and 25HN45, Rusco (1960) implies that the Blue Stone focus is a northwestern manifestation of the central Glen Elder Focus of the White Rock Aspect in northern Kansas. This would appear to imply that the White Rock Aspect sites that

have been identified or might be potentially identified in the Harlan County area would likely be immigrant sites having a sparse settlement pattern. Since Rusco's work, no clearly distinguishable White Rock sites have been identified by any survey in Harlan County.

The Dismal River Aspect (AD 1600 - circa AD 1725)

Perhaps the most unique occupation in the Upper Republican River Basin is the appearance of the Dismal River Aspect of the Plains Apache. More has been published about the Dismal River Apache than on any of the other former occupants in Harlan County (Wedel 1986, Champe 1949, Gunnerson 1960, 1969a, 1987, Gunnerson and Gunnerson 1971, 1988, Adair and Brown 1987). The Dismal River settlement at White Cat Village (25HN37) is one of the northernmost and easternmost Apachean settlements recorded (Gunnerson 1960, 1987). Not only have the remains of distinctively Dismal River house structures been excavated, with their pentagonal support post configuration, but mica-tempered potsherds that uniquely identify the Dismal River Apache have also been recovered. French trade goods, including a trade axe, iron arrow points, and gun flints of European origin have been recovered in and around White Cat Village. Although 25HN37 is the most well-known of these sites, Dismal River components have been reported from 25HN44 and 25HN136 (Roll 1968, Roetzel 1982). During the present survey, Dismal River sherds were observed along the shore in the vicinity of 25HN37. As in the case of the White Rock Aspect, because the settlement at White Cat Village might well be termed a peripheral Dismal River site, one would not expect a high density of such sites in the Republican River Basin.

Proto-Pawnee and Pawnee (AD 1750-1872)

Protohistoric and Historic Native American occupations are poorly represented in the known archeological record at Harlan County Lake, although it is believed that Proto-Pawnee and Republican (or Kitehaki) Pawnee occupations in the Upper Republican River Valley begun in the mid-eighteenth century (Hyde 1951, Grange 1968, 1992). Occasionally, sherds, beads, projectile points, and rifle cartridges are recovered from the surface that may have Proto-Pawnee or Pawnee affiliation. However, no site has been excavated in Harlan County that can be directly affiliated with the Late Prehistoric or Historic groups. This may well be due to a difference in settlement pattern from previous occupants.

It is well documented that the Proto-Pawnee and Pawnee were engaged in the trading of deer hides with the French and other early European contacts (Hyde 1951, Wedel 1986, Sunder 1965, Grange 1968, 1992). One aspect of hide preparation requires that the skins be stretched on frames or pegs to be dried. In the

Harlan County area, the best location for hide processing and drying is on the tops of the hills, where the dry west winds can be exploited. As a result, one would expect Pawnee occupations to be nearer the higher hills, although close to potable water. One of the earliest settlers in Alma, Nebraska, Frank Shaffer reported having to remove as many as 1200 drying stakes from an acre of land he was plowing (Rogers 1967, Editors of the Harlan County Journal 1906). While this is undoubtedly an exaggerated figure, it certainly indicates an extensive occupation by Pawnee, in this case on the northeast bank of Cook Creek near the town of Alma.

Because most of these upland sites either lie outside of the Corps of Engineers project boundaries or are in areas yet to be surveyed in the Harlan County Lake area, it is not surprising that very little Late Prehistoric or Historic Native American material has been recovered by previous surveys.

Historic Euroamerican (AD 1872 - present)

Although local legends persist concerning early Spanish contacts in the Harlan County area, there is no substantiation for them. The best evidence for early European contact consists of French trade goods found in Dismal River contexts at White Cat Village (25HN37) (see above) and some isolated finds near Prairie Dog Creek (Champe 1950, Gunnerson 1960, Gunnerson and Gunnerson 1988, Watkins 1988). Some European trade goods have also been observed in local collections (Paul Prettyman, William Surface, personal communication 1992).

The initial Government Land Office survey of Harlan County in the Nebraska Territory was completed in 1869 (Anonymous 1869). The actual settlement of Harlan County began in 1870 with the construction of military stockade at Melrose, approximately 1½ miles northwest of the present town of Orleans. The stockade served as a small military post that provided protection for a military road that ran roughly parallel to the Republican River's north bank and as a way station for traffic along the road. It also housed a small general store and soon became a focus for the first hunters and trappers who first came to the area in late 1869 and early 1870. As a result, Melrose became the first town platted in Harlan County. But, as political and economic conflicts developed between Melrose and other settlements and towns in Harlan County, Melrose declined as the towns of Orleans, Alma, and Republican City began to prosper. Late in 1872, the stockade burned down under suspicious circumstances. Melrose had ceased to exist by 1877 (Editors of the Harlan County Journal 1906, Kammerer 1972, Kuhl and Dunlay 1972).

In 1870, the first deliberate settlement of Harlan County began. Forty men with nine wagons of equipment and supplies under the leadership of retired General Victor Vifquain and Frank A.

Bieyon came from Wyoming and established the first townships in the county. Townships were awarded by lot. There were, of course some quarrels about allotments, and some of the people left to settle in other areas. Eventually, towns were platted and property ownership within the towns was established by drawing lots. By 1874, most of the current towns in Harlan County had been platted and settlement of the area had begun in earnest (Editors of the Harlan County Journal 1906, Kammerer 1972, Kuhl and Dunlay 1972).

One of the original "founding forty", J.W. Foster built the first home in Harlan County on the southeast side of Cook Creek just west of the current town of Alma. His farmstead served as a stopover, at one point, for Gen. Sidney Johnston's army as they passed through on their ways to subdue the recalcitrant Mormons in Utah. For many years thereafter, military paraphernalia could be collected from Foster's fields. Foster was buried on his farmstead per his request, but his grave was moved to the Alma cemetery in 1946 when his farmstead was threatened by inundation from the flooding of the valley by the Harlan County Dam (Editors of the Harlan County Journal 1906, Kammerer 1972, Kuhl and Dunlay 1972).

Also in 1871, more permanent settlers began to homestead the area. J.H. Gould built a cabin on the west side of Tipover Creek, which he named after his wagon broke a tongue while crossing the creek and tipped over. In the same year, Gilbert Parish built a cabin near Prairie Dog Creek, on the south side of the Republican River. His son, Harlan, named for the county, was the first "white male" born in the county. Another sod settlement was built by a Mr. Cobledick near the original town of Republican City. Cobledick was from Illinois. His property is now inundated (Editors of the Harlan County Journal 1906, Kammerer 1972, Kuhl and Dunlay 1972).

As is often the case in the history of early pioneer settlements, there were a number of initial failures. In fact, the town of Alma was dissolved between 1872 and 1874. Nevertheless, Alma was reestablished and, after bitter political conflict between Orleans, Alma, and Republican City, several local referendums, and a lawsuit in the state court, Alma became the county seat. With the successful homesteading of the area, the local economy began to prosper. Stores were established in the larger towns of Orleans, Alma, and Republican City and several mills had been started on the local creeks, including grist mills and shingle mills (Editors of the Harlan County Journal 1906, Kammerer 1972, Kuhl and Dunlay 1972).

Prosperity brought doctors, lawyers, school teachers, and small entrepreneurs to the area and, with the advent of the Burlington railroad system, Harlan County became an important shipping point for local cattle companies. Prosperity and an

increased population also brought its share of trouble. In fact, the first Fourth of July celebration in Harlan County in 1871 also produced its first murder. Fifty-six people attended a picnic and celebration at the Foster Farm near Alma (see above). Mr. William McBride was shot to death after an altercation with a "drunken" soldier named Costello, who was stationed at the Melrose Stockade. For another case in point, Dr. George Deans, who was the first doctor in Republican City in 1874, on relocating his practice to Alma in 1882, remarked that he had enough of patching up the results of drunken cowboy brawling (Editors of the Harlan County Journal 1906, Kammerer 1972, Kuhl and Dunlay 1972).

Natural disasters also plagued the early settlers of Harlan County. Blizzards in 1872, 1873, and 1888 caused major cattle losses. Droughts coupled with dust storms in 1873-1877, in 1894, and from 1933-1935, destroyed much of the crop and grazing lands in the area. In 1874 and 1934 these droughts were also accompanied by infestations of grasshoppers so severe that the insects actually ate window mullions on some of the local homes. It is also reported that, in 1872, 4,000 buffalo stampeded through the center of Republican City. Moreover, the Republican River was subject to seasonal flooding before the installation of water control and reservoir dams in the 1940's and 1950's. Harlan County was subjected to a series of severe floods at the beginning of the twentieth century, the worst being recorded in 1935, when an eight foot wall of water swept down the river, killing more than 100 people. (Editors of the Harlan County Journal 1906, Graff 1988, Kammerer 1972, 1976, Kuhl and Dunlay 1972, Sheldon 1931, Starr 1940, Western Historical Company 1882, Roger 1967).

More germane to a discussion of the Harlan County Lake project area, however, is the history of Republican City, which was eventually inundated by the flooding of the valley by the Harlan County Dam and the foundations of which are now being exposed as the lake is being drawn down.

The first settlement in the Republican City township was a sod house constructed by William Schluntz, 9 miles northeast of the original Republican City on Turkey Creek. The sod house was located 1/4 mile south of the present house on that land (Kammerer 1972, Kuhl and Dunlay 1972).

Old Republican City was platted at the mouth of Mill Creek (Figure 1.) and constructed from lumber carted in from Grand Island, Nebraska, by Dr. John McPherson in 1874. It was named for the Republican River, which had taken its name from a splinter band of the Pawnee that was believed to have had a Republican form of government. McPherson founded the McPherson Normal College in Republican City in 1884. It was the first formal teacher's college in the region. The college was disbanded in

1891 and the dormitory was converted into the Burlington Hotel which was run by Pearl McPherson. The rest of the college buildings burned down within a few years in one of the several fires that have plagued Republican City. The bell from the college was eventually installed in the Presbyterian Church. John McPherson's brother, Charles E. McPherson, also homesteaded in Republican City and founded one of its first dry goods stores. He later became very influential in the Nebraska business community and in the legislature (Sheldon 1931, Starr 1940).

H.M. Luce was one of the first to settle in Old Republican City itself. He became the first city superintendent and opened the first drug store in Republican City. His nephew, C.A. Luce, served in the Nebraska State Legislature in 1885. Eureka Creek was named by H.M. Luce after he exclaimed "Eureka!" as he established his homestead there (Kammerer 1972).

In 1872, Joseph Snyder opened a shingle and saw mill in Republican City. Later a grain mill was also opened there. The two mills gave Mill Creek its name. By 1880, Republican City boasted 31 other businesses besides the saw mill and grain mill, including 4 general stores, a drug store, 2 blacksmiths, 2 boot shops, harness shops, a shoe store, and two hotels (Kammerer 1972, 1976).

The Methodist Church in Republican City was the first church established in the county. The first Lutheran church in the county was established in Republican City in 1883. Other churches established in the town included Presbyterian, Christian Tabernacle, Community Church, Seventh Day Adventist, and Christian Scientist denominations. The first Masonic Lodge was chartered in July of 1882 (Kammerer 1972, 1976).

Dr. George Deans was the first doctor in Republican City, beginning his practice in 1874. The first lawyers in the county were located in Republican City: J.D. Stoddard in 1876 and A.E. Pinkney in 1879 (Kammerer 1972, 1976).

A pontoon bridge was built across the Republican River at Republican city in the late 1890's and was eventually replaced with a more permanent structure. The bridge at Republican City was one of the few not damaged severely in the 1935 Republican River flood (Kammerer 1972, 1976, Jerry Waldo, personal communication 1992).

After the flood, it became obvious that water control features had to be added to the Republican River Drainage. By late 1939 a Republican Valley irrigation and dam project was in the planning stage and by 1940 the Corps of Engineers had been given initial authorization to plan what was then called the Harlan County Reservoir and planning meetings were held along the Republican River Drainage. By 1944, plans were completed and it

became obvious that the town of Republican City would be inundated by the flooding of the pool behind the dam. Therefore, the town would have to be relocated. Lands affected by the project began to be acquired in 1946, with construction beginning early in 1948. Although reluctant to leave, many residents of Old Republican City moved to the present location of the town. Several of the structures from the old town were moved to new locations. In 1952, the lake was flooded to full pool depth and Republican City was completely inundated. To this day, there are many who still wistfully recall the glories of days in Old Republican City (Kammerer 1972, 1976, Kuhl and Dunlay 1972, Graff, 1988, Rogers 1967).

In 1989, with the drawdown of the lake below full multipurpose pool level (1946' msl), the remains of Old Republican City were exposed again. Many of the former inhabitants of the town are known to have collected souvenirs and relics from the site. The foundations of most of the structures that comprised Old Republican City were still intact and many people were able to recall the exact location of the shops and homes there (Jerry Waldo, Paul Prettyman, John P. Bailey, personal communication 1992). No systematic removal of artifacts was carried out.

As mentioned above, Republican City was situated at the mouth of Mill Creek. The appearance of chipped stone tools interspersed with historic material remains on the surface of the old townsite indicates that Old Republican City was built on top of an earlier prehistoric Native American settlement or settlements. The possible prehistoric occupation of lands adjoining the perennial feeder creeks of the Republican River, in this case Mill Creek in Harlan County, fits the settlement pattern discussed by previous investigators (Pepperl and Falk 1979, Roetzel et al. 1982, Moore 1988, Watkins 1988).

Although the town was levelled before inundation and context was disturbed after 1989 by local collectors, some subsurface integrity is still probable, particularly for the prehistoric component.

CHAPTER SEVEN

RESULTS

The scope of the current project encompassed identification by reconnaissance survey of new sites exposed by the drawdown of Harlan County Lake to 1931.8' msl elevation, relocation of previously identified sites between the 1945' msl elevation and the current survey area that were previously affected by drawdown, and the assessment and comparison of impacts on both. The survey was further charged with applying the data collected during the survey to aid in the development of a new management plan for the cultural resources in the Harlan County Lake area (see FIELD METHODS above). Although much of the time during the pedestrian reconnaissance survey of the lake shore actually required that identification and relocation of sites and impact assessment be carried out simultaneously, for the sake of clarity of description the results of the identification and relocation of sites portion of the field work is here separated from the assessment of impact.

Results of Pedestrian Reconnaissance Survey

Two (2) new sites were recorded on the shore of Harlan County Lake between the 1940' msl elevation and the 1931.8' msl elevation: one prehistoric (the North Cove Mammoth site [25HN85]) and one historic (Old Republican City [25HN82]). Appropriate site forms were filed with the Nebraska State Historical Society. In addition, two (2) previously unrecorded sites were identified on the project area that were not exposed by the drawdown of the lake but survey and testing were deemed necessary by the on site archeologist (see "Field Methods" above and Appendix). At the request of the Nebraska State Historical Society, site 25HN504 (the Old Orleans Mill) was also surveyed and mapped (see Appendix).

For verification purposes, limited collections were made of diagnostic artifacts and/or ecofacts.

After consulting the reports of previous surveys of the Harlan County Lake project area, it was determined that 55 of the 174 previously located sites fell within the scope of the current survey (see Pepperl and Falk 1979 or Roetzel et al. 1982). These were sites that were located primarily between the 1945' msl elevation and the current lake level. Of the 55 previously identified sites for which an attempt was to be made to relocate them within the scope of the planned shoreline reconnaissance survey, only 28 (~51%) site areas could be relocated with any accuracy. Of those 28, only 8 (~29%) could be said to have maintained contextual integrity. Five (5) of those sites (25HN134, 25HN135, 25HN136, 25HN137, and 25HN139) were determined to have been greater in size and content than had been previously

reported and amended site forms were subsequently filed with the Nebraska State Historical Society. The other three (3) sites (25HN11, 25HN37, and 25HN45) were determined to be recently exposed or eroded surfaces of sites of reasonably good contextual integrity. It was felt that no amended site forms needed to be filed in those cases because all three had been intensively investigated in the past.

The remaining 27 sites recorded by previous surveys that were within the scope of the planned shoreline reconnaissance survey were not relocated for a variety of reasons. First, twenty (20) sites that had initially been recorded as lithic scatters had undoubtedly been either eroded or redeposited from their original contexts. Specifically, sites 25HN113, 25HN114, 25HN115, 25HN148, 25HN149, 25HN33, 25HN131, 25HN132, 25HN133, 25HN165, 25HN143, 25HN166, 25HN167, 25HN54, 25HN171, 25HN56, 25HN162, 25HN128, 25HN129, and 25HN110 could not be relocated save for an occasional isolated find of a flake. No pattern of surface deposition could be determined in any of those cases that would reaffirm the existence of a site in their respective previously mapped locations. Moreover, sites 25HN131, 25HN132, 25HN133, 25HN165, 25HN143, 25HN166, 25HN167, 25HN171, 25HN162, 25HN128, 25HN129, and 25HN110 were initially identified at the bases of the high bluffs that border the southern shore of Harlan County Lake. It is entirely possible that these lithic scatters were, in fact, concentrations of redeposited material eroding from the faces and surfaces of the bluffs and deposited on the beaches by runoff water.

The remaining unrelocated sites were determined either to have been buried under silts being pushed up along the shore or were so extensively covered by vegetation as to be unavailable to pedestrian reconnaissance survey.

Specific Site Descriptions

The following are brief discussions of sites for which new or amended site forms have been filed.

North Cove Mammoth Site (25HN85)

The North Cove Mammoth site is located on the north shore of Harlan County Lake about 4¼ miles east of Alma, Nebraska. It was discovered during pedestrian survey of the shoreline during the week of 14 July - 21 July 1992 when the elevation of the lake was at 1932.1' msl. The area was resurveyed twice later in the season when the lake elevation was 1931.8' msl. The site itself is approximately 150 meters long, east to west along the shore, and 35-50 meters wide, north to south from the water's edge upslope toward the cutbank. Currently, the site elevation ranges from 1934' msl to 1931.8' msl. At least 95% of the surface of the site is unvegetated muddy shoreline. The soil consists of

unconsolidated loess and is a light grey-brown to 40 cm deep.

Mammoth (Mammut jeffersonii) bone, tusk, and tooth fragments were recovered scattered across the surface of the site. More tusk material was recovered from 1.5 meters out into the lake and some 25-35 cm below the water's surface. This indicates that the site extends into the lake below the 1931.8' msl elevation, but the actual extent of the site beneath the surface could not be determined.

Lithic materials were also recovered during the surface survey and included 2 flakes of Niobrara chert/jasper: one brown, the other banded red and pink. Also recovered from the surface was 1 triangular unifacially worked scraper made of dark brown Niobrara chert/jasper (Figure 4d) and 2 other worked flakes that might be interpreted as scrapers. Two (2) retouched flakes of red Niobrara jasper/chert were also recovered, one with heavy unifacial retouching on its edge and both with apparent "spurs" - single, sharp, triangular projections deliberately left attached to an edged lithic tool (see Table 3.).

These lithics do not necessarily confirm the association of human activity with the mammoth remains, however. The North Cove Mammoth site is near two previously identified prehistoric sites (25HN148 and 25HN149) and a historic site (25HN53). No cultural affiliation was assigned to the prehistoric sites (Roetzel 1982). The possibility exists, however, that the gradual drawdown of the lake from the 1946' msl elevation and downslope runoff and rill erosion (see "Analysis of Impact" below) have combined to deflate the prehistoric sites and to redeposit some of the material from those sites along the current shoreline in the area of the mammoth remains.

The presence of "suspect" lithics in association with the mammoth remains does not preclude the possibility of the site's having Paleoindian affiliation. Moreover, it's location in relation to the pre-inundation geomorphology of the valley places it between 3 and 10 meters below the original surface of the former hill slope. It's approximate position in relation to the pre-inundation soil surface supports the site's potential as a formerly deeply buried Paleoindian site (see Martin 1991, Mandel 1992). Furthermore, the site's proximity to 25HN164, which has tentatively been given a Paleoindian cultural affiliation (Adair 1988), would also seem to support the possibility that the North Cove Mammoth site might have Paleoindian material associated with it.

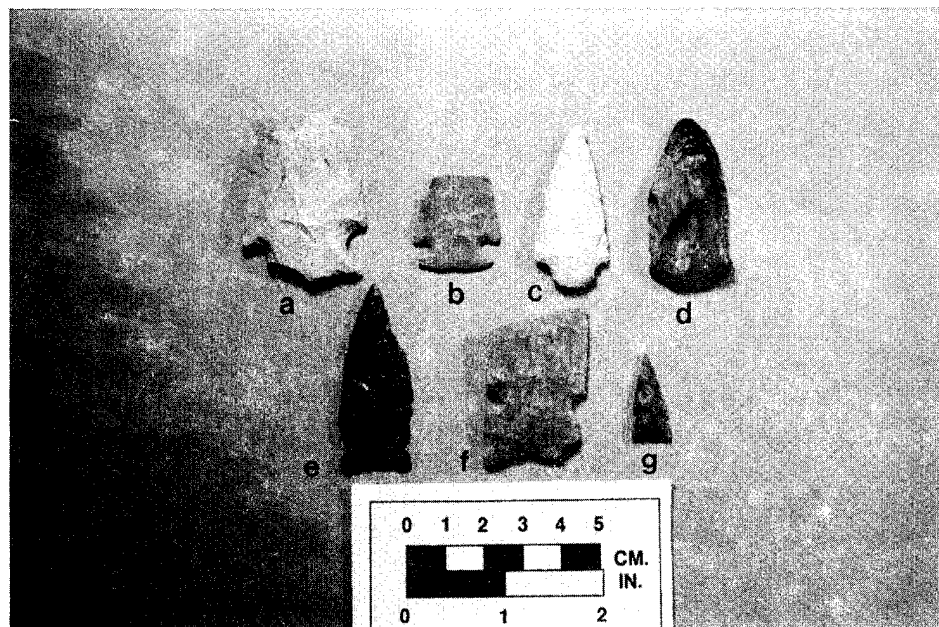


Figure 4. Prehistoric Lithics. a-c. Projectile points (25HN82); d. Scraper (25HN85); e. Projectile point (IF#4); f-g. Projectile points (IF#5).

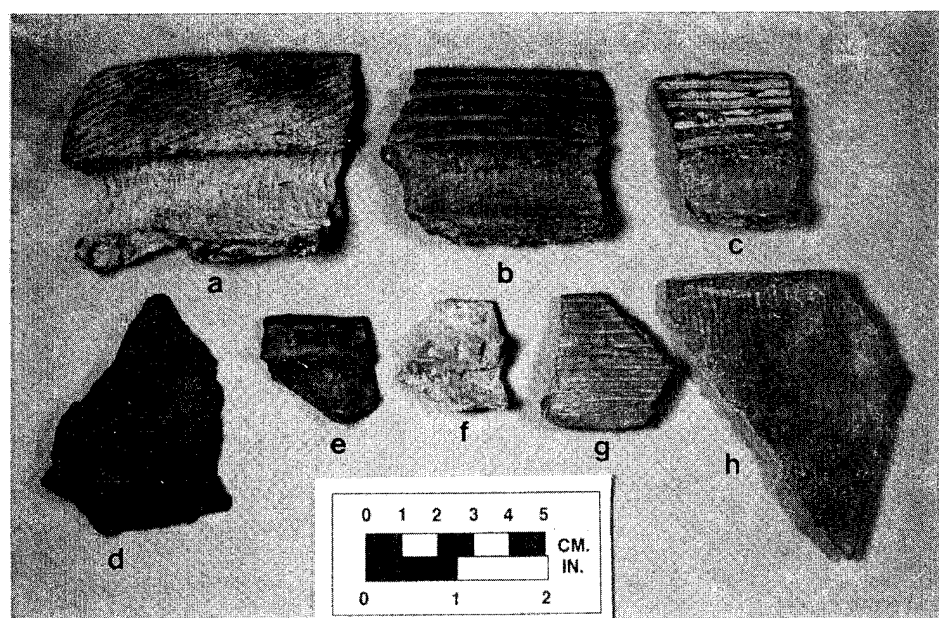


Figure 5. Prehistoric Ceramics. a. Rim sherd (25HN134); b. Rim sherd (25HN135); c. Rim sherd (25HN136); d. Body sherd (25HN137); e. Rim sherd (25HN137); f-h. Rim sherds (25HN139).

Table 3. -- Artifacts Collected during Drawdown Survey at Harlan County Lake.

North Cove Mammoth Site (25HN85)

- 2 flakes, Niobrara chert/jasper (1 brown, 1 banded red and pink)
- 1 triangular unifacially worked scraper, dark brown Niobrara chert/jasper
- 2 reworked flakes, Niobrara jasper/chert (possibly scrapers)
- 2 retouched flakes, red Niobrara jasper/chert, 1 heavily unifacially retouched on one edge, both with apparent "spurs".

Old Republican City (25HN82)

- 1 flake fragment, Niobrara jasper/chert
- 4 biface fragments, Niobrara jasper/chert
- 1 fragment, ovate biface, Niobrara jasper/chert
- 1 drill, Niobrara jasper/chert
- 4 corner-notched projectile points, Niobrara jasper/chert
- 1 projectile point tip, Niobrara jasper/chert
- 1 "turtle-backed" scraper, Niobrara jasper/chert
- 1 center of a unifacially, alternately beveled knife, Niobrara jasper/chert
- 1 unifacially worked flake, Niobrara jasper/chert
- 1 biface, unknown cherty material
- 1 piece ivory
- 1 fragment of blue shell-edged ware (circa 1850-1870's)
- 1 fragment corroded metal (possibly zinc)
- 1 clear glass bottle with embossed raised script lettering
- 4 pieces of whiteware with maker's marks
- 1 piece of a pressed milk glass plate rim
- 1 base of a china cup marked "Czechoslovakia" with embossed maker's mark

Collected by Robert J. Ziegler, 17 October 1990:

- 1 fragment, white ironstone saucer, marked "J & G Meakin, Hanley, England"
- 1 clear glass extract bottle, embossed "California Perfume Co. Fruit Flavors"
- 1 Mason jar white glass lid in zinc screw cap
- 1 partly melted fragment, thick amber bottle glass
- 1 molded amber glass bleach bottle neck
- 1 amber glass bottle neck, applied lip
- 1 pale blue green molded bottle neck
- 1 "amethyst" molded bottle neck, large jug
- 1 "amethyst" molded extract/medicine bottle neck, tool-finished lip
- 2 "amethyst" molded bottle necks, applied lip

Old Republican City (25HN82) (continued)

- 2 "amethyst" molded bottle bases, 1 embossed "company"
- 1 fragment, "amethyst" screw cap jar
- 1 "amethyst" glass bottle stopper
- 1 fragment bathroom porcelain faucet handle
- 1 corroded wire nail

25HN134

- 2 cord roughened bevelled rim sherds, sand temper
- 8 cord roughened body sherds, and temper
- 1 smooth body sherd, sand temper
- 1 painted china plate sherd
- 1 whiteware body sherd, red and blue bands on exterior
- 1 biface fragment, Niobrara jasper/chert
- 3 flakes, Niobrara jasper/chert
- 1 mussel shell fragment

25HN135

- 2 incised bevelled rim sherds, sand temper
- 5 cord roughened body sherds, sand temper
- 1 unifacially bevelled flake, Niobrara jasper/chert
- 1 fragment of mineralized mammal bone

25HN136

- 1 incised bevelled rim sherd, sand temper
- 12 cord roughened body sherds, sand temper
- 2 biface fragments, Niobrara jasper/chert

25HN137

- 1 bevelled rim sherd, sand temper
- 1 interior sherd fragment, sand temper
- 5 smooth body sherds, sand temper
- 5 cord roughened body sherds, sand temper
- 1 flake, Niobrara jasper/chert

25HN139

- 1 cord impressed, smooth lip, rim sherd, sand temper, possibly Woodland
- 1 cord impressed body sherd, sand temper
- 1 recurved rim with smooth lip and raised pyramidal decoration around rim, sand temper
- 1 cord roughened bevelled rim with impressed fluted decoration at base of rim, sand temper
- 1 incised bevelled rim sherd, sand temper
- 1 cord roughened bevelled rim sherd, sand temper
- 2 cord roughened body sherds, sand temper

25HN139 (continued)

- 2 burnt fragments, Niobrara jasper/chert
- 2 biface fragments, Niobrara jasper/chert
- 1 unifacially retouched flake, Niobrara jasper/chert
- 1 unifacial scraper fragment, Niobrara jasper/chert
- 24 flakes, Niobrara jasper/chert
- 1 piece of shatter, Niobrara jasper/chert
- 1 fragment of mineralized mammal bone

Old Republican City (25HN82)

Old Republican City is located approximately 4¼ miles east of Alma, Nebraska, on the north shore of Harlan County Lake near the mouth of Mill Creek. The site covers approximately 350 acres. The original town was levelled and some of the buildings were relocated in other parts of the county before the inundation of the Republican River Valley by the completion of the Harlan County Dam. Currently, most of the site area is densely covered with stands of willows and cottonwoods, as well as water-loving plants like knotweed, horseweed, curly dock, thistles, and goldenrod. Surface visibility is generally below 10%. Some of the town is still inundated. The site elevation ranges from 1960' msl to 1931.8' msl.

The remains of the town of Old Republican City began to be exposed by lake drawdown in 1989. The foundations of most of the structures were and are still intact. During the initial phases of the drawdown of the lake, the context of the site was disturbed by local collectors, primarily original town inhabitants and their descendants and by people from the surrounding towns in Harlan County. Other known disturbances to Old Republican City include two major fires before 1915 and three floods, including the disastrous 1935 Republican River flood.

Before relocation, razing, and inundation, Old Republican City had undergone changes from a farming community to a cattle ranching community, to a railroad shipping community, and finally returned to a farming/ranching community before its destruction in 1952.

The town once had a normal (teacher's) college, three mills (shingle, saw, and grist), a smithy and farrier, a saddlery, four hotels, a bank, a furniture maker/undertaker, a public school, a grocer, a hardware store, a druggist, at least two gasoline stations/ garages, and other standard features of a Central Plains farming/ranching community. Currently visible at the south edge of the town site is an old railroad grade and two sets of bridge supports (see also "Cultural History").

The appearance of chipped stone tools interspersed with historic material remains on the surface of the old townsite indicates that Old Republican City was built on top of an earlier prehistoric Native American settlement or settlements. The possible prehistoric occupation of lands adjoining the perennial feeder creeks of the Republican River, in this case Mill Creek in Harlan County, fits the settlement pattern discussed by previous archeological surveys in Harlan County (Pepperl and Falk 1979, Roetzel 1982).

No systematic investigation or removal of archeological material from Old Republican City has ever been done. During the

current survey representative and diagnostic materials were collected from the surface of the old city site. Aside from the chipped stone tools mentioned above, historic materials dating from the mid- to late nineteenth century to the middle of the twentieth century were recovered (Table 3., Figures 6-7).

The North Shore Amended Sites: 25HN134, 25HN135, 25HN136, 25HN137, 25HN139

The five (5) "amended" sites listed above are spaced along a 1½ mile stretch of the north shore of Harlan County Lake between the Old Republican City site and Alma, Nebraska. When they were initially identified by Roetzel's survey of the lake shore between the 1945' msl and the 1938.6' msl elevations, they were described as habitation sites affiliated with the Upper Republican Aspect, based on lithic and ceramic artifacts recovered during the survey. The current survey concurs with this identification, but adds that at least one Woodland Period sherd was recovered from the vicinity of 25HN139 which indicates it is a possible multicomponent site.

However, since the drawdown of the lake to 1931.8' msl elevation, these sites have been revealed to have a much greater size and density than originally thought. Not only do they extend further down the slope toward the shore than believed earlier, but the density of artifacts being revealed by wave erosion at the shoreline indicates that the sites extend farther out into the lake. Further, the density of artifacts revealed by wave action suggests that much of the material contained in the sites is still buried beneath the exposed shore, perhaps as much as 2 meters beneath the 1945' msl elevation. Moreover, materials exposed on the beach indicate that the boundaries of these sites extend farther along the shore, east to west, than originally thought.

Site 25HN134, for example, is represented at the 1945' msl elevation by a light scatter of lithic flakes and small cord-roughened, and tempered body sherds that extends approximately 50-60 meters east to west along the beach. With further beach exposure since the drawdown, the scatter of lithics and sherds extends east to west as much as 75 meters at lower elevations and extends north to south some 100-125 meters to the shoreline. The appearance of dense concentrations of large body and rim sherds at the fluctuation zone at the lake's edge indicates that the site extends farther out into the lake. Representative body sherds and diagnostic bevelled rim sherds of Upper Republican affiliation were recovered from the fluctuation zone (Table 3., Figure 5).

A similar pattern is evinced in sites 25HN135, 25HN136, and 25HN137. The original report of each site describe light to medium concentrations of lithics and Upper Republican sherds

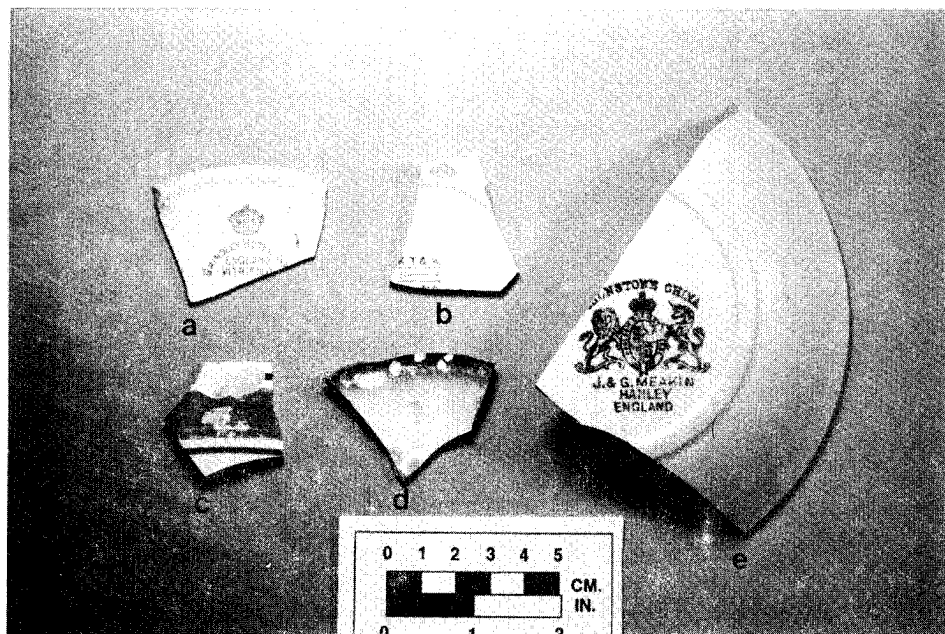


Figure 6. Historic Ceramics. a. "Grindley Hotel Ware" (25HN82); b. "K.T. & K." (25HN82); c. Red and blue banded ware (25HN134); d. Blue shell-edge ware (25HN82); e. "J. & G. Meakin" (25HN82).



Figure 7. Historic Bottle Glass from 25HN82. Top bottle embossed "Fruit/California Perfume Co./Flavors."

extending between 50-60 meters along the 1945' msl elevation. As in the case of 25HN134, the current survey discovered that the sites extend north to south from the 1945' msl elevation to the current shoreline where dense concentrations of lithic flakes and Upper Republican body and rim sherds are being exposed by wave action. Limited collections of diagnostic or representative materials were recovered (Table 3., Figure 5).

In the case of site 25HN139, a few small lithic flakes scattered over a wide area (75-80 meters east to west) were the only remnant observed of the originally recorded site. However, at the fluctuation zone along the lake shore, another dense concentration of ceramics and lithics was observed. From this area were recovered several diagnostic rimsherds of Upper Republican affiliation and one cord-impressed rim sherd of Woodland cultural affiliation (Table 3.).

Because the sizes and densities of the North Shore sites were revealed to be dramatically different from the sizes and densities recorded by the original 1979-80 survey, it was deemed necessary to file amended site forms for them with the Nebraska State Historical Society.

Isolated Finds

In addition to artifacts recovered from areas in which the context of the materials was discernible, a number of isolated finds of artifacts and specimens of paleofaunal material were collected during the drawdown survey of the shore of Harlan County Lake. Although clear context could not be established for any of the material, many of the items recovered gave insight into the various periods of occupation in the Republican River Valley (e.g. Isolated Find numbers 4,5,6,8,9, and 10). Others were helpful in understanding the post-depositional processes acting on sites in the areas from which they were recovered (e.g. Isolated Find numbers 5,6, and 7) (Table 4., Figure 4).

Table 4. -- Isolated Finds, Drawdown Survey, Harlan County, Nebraska.

ISOLATED FINDS

IF #1: (West Shore of Patterson Harbor)

- 1 biface fragment, Niobrara jasper/chert
- 1 biface, Niobrara jasper/chert

IF #2: (East Shore of Bone Cove)

- 2 spent bifacial cores, Niobrara jasper/chert
- 2 bone awls or needles, possibly fish or bird bone

IF #3: (South Shore of Prairie Dog Bay)

- 2 biface fragments, Niobrara jasper/chert
- 1 unifacially retouched flake, Niobrara jasper/chert
- 2 flakes, Niobrara jasper/chert

IF #4: (East Shore of Prairie Dog Bay)

- 1 fossilized merycoidodon horn
- 1 projectile point, possibly Archaic, Niobrara jasper/chert
- 2 mammoth foot bones

IF #5: (White Cat Point near 25HN37)

- 1 hammerstone, Niobrara jasper/chert
- 1 spent core, Niobrara jasper/chert
- 2 unifacially worked knife/scrapers, Niobrara jasper/chert
- 2 biface fragments, Niobrara jasper/chert
- 7 unifacially flaked blunt nosed scrapers, Niobrara jasper/chert
- 4 retouched flakes, Niobrara jasper/chert
- 1 dark red flake, Niobrara jasper/chert
- 1 flake dark grey chert
- 1 piece of pink chert shatter
- 1 piece of burnt daub
- 1 side-notched projectile point, dark grey chert
- 1 indented-based , side-notched projectile point base, quartzite
- 1 flake dark banded flint
- 1 smooth flaring rim sherd, possibly Dismal River, micaceous temper

IF #6: (White Cat Point near 25HN11)

- 2 biface fragments, Niobrara jasper/chert
- 2 unifacial scraper fragments, Niobrara jasper/chert
- 1 flake Niobrara jasper/chert
- 1 piece of daub
- 5 cord roughened body sherds, sand temper
- 2 smooth body sherds, sand temper

IF #7: (Mosasaur Site)

- 5 mosasaur skeletal elements
- 1 biface, Niobrara jasper/chert
- 2 retouched flakes, Niobrara jasper/chert

IF #8: (East Shore of Mouth of Methodist Creek)

- 3 bifaces, Niobrara jasper/chert
- 1 "knife", Niobrara jasper/chert
- 1 flake, Niobrara jasper/chert
- 1 biface fragment, possibly Alibates flint
- 1 flake "snowflake" obsidian

IF #9: (West of North Cove between 25HN134 and 25HN135)

- 1 used scapula hoe, probably Bison sp.

IF #10: (Sindt Point)

- 1 scapula, some use-wear, possibly hoe, probably Bison sp.

CHAPTER EIGHT

ANALYSIS OF IMPACT TO SITES

The Harlan County Lake Project is a multiple purpose facility whose functions include flood control, storage for irrigation, and recreational and agricultural use. The cultural resources surrounding the lake are therefore subject to both environmental and human impact.

Because of their responsibilities to preserve and protect cultural resources on Federal lands, the U.S. Army Corps of Engineers and the National Park Service have conducted extensive research into damage, damage assessment, and mitigation of damaged or deteriorating cultural resources. Many of these studies have dealt specifically with erosional and other impacts at reservoir lakes and are, therefore, germane to any discussion of assessment and mitigation of such impacts at Harlan County Lake that might affect cultural resources (Ebert et al. 1989, Leatherman 1980, Lenihan et al. 1977, 1981, Mann et al. 1992, Mathewson ed. 1991, Padgett 1978, Thorne et al. 1987, Ware 1989). Further, all of the archeological surveys conducted at Harlan County Lake since the early 1970's, have attempted to define and describe impacts to cultural resources in and around the lake (Pepperl and Falk 1979, Roetzel et al. 1982, Watkins 1988, Moore 1988). These earlier reports were very useful during the current survey in aiding in the definition and description of potential, current, and ongoing impacts to cultural resources in the Harlan County Lake area.

Wet/Dry Cycling

Some of the National Park Service and Corps of Engineers reports deal specifically with physical-chemical-biological processes that affect materials that are either inundated or are exposed to wet/dry cycling processes (Lenihan et al. 1977, 1982, Mathewson, ed. 1989). In general, such reports are encouraging with regard to the actual preservation of material in its original context. However, the exposure of floral and osteological remains and ceramic artifacts to cyclical wetting and drying events dramatically reduces their survivability.

In most cases of sites located on the beach in the Harlan County Lake area, wet/dry cycling processes are currently affecting preservation of artifacts and faunal materials that are being exposed and then re-inundated by the fluctuation of the lake level. This is particularly true of the recently discovered mammoth site on the North Shore (25HN85) and of the Upper Republican sites in the same area (e.g. 25HN134, 25HN135, 25HN139). Some mitigation of such sites may be required in the future if the lake level continues to fluctuate between 1935' and 1930' msl.

Fluctuation Zone: Terracing and Shoreline Erosion

Another consequence of the fluctuation of the lake level is the development of terraces from which the lake-facing side is eroding and the shore facing side is being raised above the beach elevation by continual deposition of sands, weeds, and other litter (Ebert et al. 1989, Lenihan et al. 1977, 1981, Ware 1989). The lake-facing side is, therefore, gradually being deflated and moved further into the lake by wave action. The shore-facing side of the terrace, however, is being built up. Furthermore, the shore-facing side of these terraces acts as a dike preventing much of the material that is washed onto the beach from sites further up the beach or on top of the cutbanks from washing downslope into the lake. The upshot of this runoff process is a deposition of small and light artifactual and ecofactual material behind the terrace and a subsequent silting in of the resulting material concentration in its new context. This process probably best explains the concentrations of artifacts observed along old beach lines and terraces at Harlan County Lake. It is unlikely, therefore, considering the low intensity of the wave action on the lake (except under high wind conditions), that these materials are being deposited on the shore from locations beneath the waterline.

Fluctuation Zone: Silting In

Indeed, there is a far more active silting in process going on parts of the shoreline than the current investigation had initially anticipated. For example, in the area around Methodist Cove, there is a very rapid deposition of silts both in the mouth of the dredged channel and along the beach to the east. This process is most noticeable where the old railroad grade runs just offshore and parallel to the current beach line. A similar silting process is taking place off Sindt point which will eventually join Sindt point to the small islet offshore with a silt bar. At the 1927' msl lake level in 1991, this silt bar was fully exposed. It appears that the silt is being "pushed up" along the shoreline in some areas of the lake.

Downslope Wash and Runoff Erosion

Another significant erosional process acting on beach sites, and one noted in previous reports (Pepperl and Falk 1979, Roetzel et al. 1982), is the downslope washing of material caused by runoff and rill erosion. The soils in the Harlan County Lake area are primarily unconsolidated eolian loess clays (Mitchell 1974, Martin 1991) (see "Environmental Setting: Geology and Soils" above). Thus, during periods of moderate to heavy rains, a great deal of soil is moved downslope by runoff water. In areas where the surface is not stable, either because of lack of ground cover or because of its having been destabilized by mechanical processes (e.g. off-road vehicles), washout channels are often

cut in the beach. These channels serve as conduits that concentrate water pressure and thus allow downslope movement of larger materials and deeper washout channeling. This process is very noticeable on both the North and South Shores. On the North Shore, area where access roads have been cut from the cutbank to the beach, the ruts in the roads have served as channels for runoff water through which material is washed onto the beach.

On the South Shore, swales and low spots on the bluff tops channel water in a similar fashion. The impact of water falling from the bluff tops then develops a channel on the beach into which are funneled artifactual and other materials being washed down from above. This is probably the primary cause of the deposition and concentration of artifacts on the South Shore beaches.

Deflation of Shore Soils

One other erosional process acting on sites in the beach areas is a gradual removal of fine particles of loess into the lake by drawdown. It is unclear how much of this material is redeposited in the zone proximate to the waterline beneath the water, but its removal from the exposed shore during drawdown contributes to the gradual deflation of the stratigraphy of sites on the beach. Leatherman's (1980) observations at Nimrod Lake and Padgett's (1978) experimental work at Blue Mountain Lake in Arkansas (site 3YEX) indicate that this gradual deflation does not cause much downslope or lateral movement of material, if any. It does, however, alter the stratigraphic context of cultural materials so as to make relative dating of deflated archeological sites more complex. It will, of course, allow exposure of previously buried material. This process is only observable in the areas where drawdown has acted on already located sites (e.g. the North Shore Upper Republican sites discussed above).

Cutbank and Bluff Erosion

Above the beach there are erosional processes affecting artifact deposition on the beach. Aside from material being washed down channels in the bluffs or cutbanks bordering the lake, there are various processes that cause the deposition of material from the cutbanks and bluffs themselves onto the beach and shore. Burrowing animals, freeze/thaw cycling, eolian and pluvial erosion, and bank damage caused by plant roots and human activities all contribute to the collapse and subsequent deposition of unstable bank material on the beach below. Materials deposited in this manner are generally found close to their "parent" bank unless further redistributed by runoff processes.

Human Impact: Agricultural

Agricultural activities have a serious impact on archeological resources (Joukowsky 1980). Plowing and other tillage activities not only destroy fragile artifacts and rearrange the context of sites, they also loosen the archeological matrix and allow eolian and pluvial erosional forces to affect artifacts and other cultural resources.

In the case of U.S. Government lands in the Harlan County Lake area that were subjected to the current survey of areas exposed by and/or impacted by the drawdown of the lake, agricultural activities in the historic past have already disturbed the context of many of the materials exposed by the drawdown. However, none of the areas below the 1945' msl are currently being tilled or used for agricultural production, nor is there any plan in the near future for returning those areas to agricultural production.

Therefore, agricultural activities have had little or no impact on the area covered by the drawdown survey. It should be noted, however, that many of the agricultural lease lands are bordered by cutbanks that were eroded away after the inundation of the valley, and that artifacts from sites buried under these lands have been redeposited on the nearby shorelines. It is possible therefore that significant cultural resources may eventually be revealed and ultimately impacted by agricultural activity.

Human Impact: Public Use and Recreational

Because of the intensive use of Harlan County Lake as a public recreation facility, there is always the potential that such activities may impact cultural resources on the project area. Vandalism, collecting of artifacts, and off-road vehicle disturbance are all potential hazards to cultural resources. However, the general terrain and vegetation, the fencing off of sensitive areas, and the diligence of the Project Manager and the Park Manager at Harlan County Lake have managed to minimize the effects of all three.

For example, regular and careful maintenance and patrol of public use areas at the lake has kept down vandalism throughout the area. The presence (or potential presence) of rangers and other park personnel has helped to promote an attitude of respect and cooperation with the public. This spirit of cooperation has also helped to discourage extensive collection of artifacts from the Harlan County Lake area. Both through clear statements and postings of the Federal regulations regarding artifact collection, and interpretive displays and talks, park personnel have managed to prevent wholesale systematic collection or

looting of cultural resources in the lake area. Moreover, the people of the county, particularly those from Republican City and Alma, have also begun to realize that they have a vested interest in preserving the local cultural history. All of these factors, coupled with heavy vegetation covering most of the previously recorded sites in the area have prevented extensive collection of artifacts on project lands. In fact, the only areas in which extensive collection of artifacts or damage to cultural resources is likely is along newly exposed beaches.

The only other significant impact on cultural resources by human activity is through off-road vehicle traffic. Again, heavy vegetation cover has aided in discouraging extensive use of the beach areas by off-road vehicles. Moreover, the unconsolidated nature of the soils that compose the beaches makes them treacherously slick and soft when wet. As a result, most off-road vehicular traffic is restricted to well-defined access trails in public use and wildlife management areas and to sparsely vegetated areas along the shore. However, all-terrain vehicles (ATVs) are less restricted because of their size and weight. As a result, ATVs have access to the newly exposed beaches. ATV traffic does indeed damage shoreline archeological sites, both by compression and, hence, fracturing of fragile artifacts and by "rooster-tailing" or chewing up the soil surface which exposes site and other beach areas to greater erosional effects. At Harlan County Lake, ATV trails are provided and ATV traffic is prohibited in many public use areas. Efforts are now under way to control the impact of ATV traffic on the shoreline. However, the large mudflats that characterize the North Shore of Harlan County Lake are easy to access and the effects of ATV traffic in those areas is clearly visible.

Therefore, although ATV traffic remains a potential source of damage to cultural resources, all in all, human activity in public use and wildlife management areas has had and is having little significant impact on cultural resources in the Harlan County Lake project area.

Summary of Impacts at Harlan County Lake

All of the processes mentioned above are impacting, to a greater or lesser degree, the sites between the 1945' msl elevation and the current lake shore at Harlan County Lake. Continued drawdown to lower elevations will eventually expose more sites to the same processes. Of primary concern for cultural resource management are those processes which act on the unvegetated shoreline within the zone of annual lake level fluctuations (currently between 1931' and 1935'). These include wet/dry cycling, terracing and shoreline erosion, downslope wash and runoff erosion, and deflation of shoreline soils. Without protective vegetation cover to stabilize shoreline soils, all these processes have severe impact on both the contextual

integrity of sites and on their associated assemblages of artifacts. Further destabilization of the shoreline by vehicular traffic can aggravate and accelerate such processes.

Changes in the rate of inflow and drawdown also affect the intensity of impact within the annual fluctuation zone. For example, if drawdown is gradual and inflow is moderate, which causes a gradual lowering of the elevation of the shoreline in stages, the impact of all of the fluctuation zone erosional processes on unvegetated shore soils is aggravated. On the other hand, if drawdown is rapid and deep when inflow is low, the process has the basic effect of reestablishing the shoreline at a lower elevation without a great deal of fluctuation in the lake level. While the lowering of the shoreline elevation dramatically increases the surface area of unvegetated shoreline exposed to downslope wash, runoff erosion, and soil deflation, its reestablishment at the lower elevation without gradually passing through intermittent elevation stages significantly reduces the impact of wet/dry cycling and terracing and shoreline erosion caused by wave action. Because wave action effectively removes artifacts and matrix from sites, the impact of a rapid and deep drawdown of the lake actually causes less damage to cultural resources along the shore than does a gradual lowering of lake elevation.

Areas between the unvegetated shore and the 1945' msl elevation are relatively secure from erosional damage depending on the density of vegetation cover. Vegetation, of course, stabilizes the soil and prevents downslope wash and runoff erosion. As mentioned earlier, the vegetated areas surrounding the lake range from sparsely covered mud flats to impenetrable woody and weedy cover in the beds and at the mouths of the ephemeral creeks that feed the lake. Sparsely vegetated areas are more susceptible to downslope wash and runoff erosion, more densely vegetated areas are less susceptible. In general, the sparsely vegetated areas around Harlan County Lake are closer to the current shoreline and consist of younger vegetation that has grown up in areas of former shoreline that have remained exposed as the lake has been drawn down. Because the sparsely vegetated areas are closer to the current shoreline, fishermen and hunters seeking access to the lake shore often drive off-road vehicles across the more sparsely vegetated land. This activity contributes to the erosion of those areas and therefore increases potential damage to cultural resources in sparsely vegetated areas. Of course, as vegetation becomes more dense and, eventually, impenetrable to such traffic, there is a similar decrease in erosion and potential impact.

At elevations higher than 1945' msl, the major sources of site degradation or destruction are cutbank and bluff erosion, which can lead to wholesale bank collapse and redeposition of cultural material from higher to lower elevations. Because bank

collapse also endangers human activity in areas of recreational and public use, efforts have been made in the past at Harlan County Lake to stabilize banks in heavily trafficked areas using rip rap, brush piles, etc. While such methods are reasonably successful in preventing large slumps and shears of banks, they do not prevent the gradual erosion of material from the banks by eolian and pluvial processes. Thus, cultural resources, particularly small and fragmentary artifacts, cannot be totally protected or conserved by such stabilization procedures. Furthermore, such methods have successful application primarily on cutbank and bluff faces that range from 1-15 meters high. While it is possible to apply the same stabilization technology to higher bluffs, cost and scale of such projects are generally too great to warrant their application to the protection of cultural resources. At Harlan County Lake, many of the bluffs along the South Shore exceed 20 meters in height. Therefore, cutbank and bluff erosion must be considered to be a significant impact on cultural resources embedded in cutbanks or on the surface of the hills surrounding the lake.

CHAPTER NINE

RECOMMENDATIONS

The purpose the reconnaissance survey conducted at Harlan County Lake from June to October 1992 was to locate and identify archeological resources, to assess the potential impact of erosional forces on those newly identified sites, and to assess the impact of on-going erosional forces on sites already exposed that may be further impacted by the drawdown. Further, those involved in the survey were charged with making specific recommendations concerning the disposition of those cultural resources to serve as guidelines for their future management. In developing these recommendations, the survey personnel on site consulted with the Project Manager and Park Manager at the Harlan County Lake Project Office and members of the Planning and Operations Divisions of the U. S. Army Corps of Engineers, Kansas City District Office. Results and recommendations from previous cultural resource surveys and management plans were also taken into account (e.g. Pepperl and Falk 1979, Roetzel et al. 1982, Adair and Brown 1987). From these consultations and background research and from on-site assessment of the cultural resources at Harlan County Lake, the following general and specific recommendations were developed.

General Recommendations

As pointed out in earlier sections, use of the lands and facilities at Harlan County Lake does pose the possibility of human disturbance or vandalism of cultural resources on U.S. Government land. However, the current policy of limiting access to much of the area to pedestrian traffic only has significantly reduced the potential impact. Further, although there are a few local artifact collectors and an occasional foray by collectors from outside the county, limited access to site areas has prevented systematic looting or vandalism of cultural resources. Moreover, regular monitoring and review of site areas has kept such activities down to a minimum. It is therefore recommended that such procedures be continued in order to continue to protect the wealth of resources in the Harlan County Lake area.

As long as drawdown of the lake to its currently low levels continues it is recommended that a monitoring program for low elevation archeological sites be instituted consisting of a regular but reasonable visual inspection of known shoreline sites. It should be kept in mind that the process of drawdown can be more or less destructive depending on the speed of the drawdown and on rate of inflow. If drawdown is rapid and inflow is slow, more unvegetated shoreline will be exposed to downslope wash and runoff erosion as well as to soil deflation processes. In such a case, it is recommended that regular and reasonable visual inspection be conducted. In the event that drawdown is

gradual and inflow is moderate, permitting a series of stable, albeit short-term, shorelines, the destructive effects of wave action will be aggravated. In such a case, the known sites on the shoreline should be monitored, particularly during windy periods, to ascertain the amount of damage being sustained by those sites.

If drawdown continues below the 1931.8' msl elevation to the projected lowest elevation (1927' msl), however, a survey of the newly exposed shoreline would be required. There is a high potential for new sites and portions of already recorded sites to be exposed to damaging environmental processes by continued drawdown. For example, the North Shore Amended sites (25HN134, 25HN135, 25HN136, 25HN137, and 25HN139), the North Cove Mammoth site (25HN85), and Old Republican City (25HN82), all appear to extend into the lake below the 1931.8' msl waterline. Further drawdown will expose those sites to wet/dry cycling, wave action erosion, downslope wash, runoff erosion, and soil deflation depending on the rapidity of drawdown.

Similarly, unrecorded prehistoric and historic sites will be exposed by drawdown to lower elevations to these destructive processes. Surveys of the valley floor before inundation were based on information gathered from local inhabitants and were thus not systematic. Therefore, basing our judgement on predictive models generated by previous surveys of prehistoric settlement patterns and previously recorded sites in the Republican River Valley, we have every reason to expect concentrations of sites between 1930' and 1925' msl both along the shoreline and near the mouths of the ephemeral feeder creeks. These areas would still be part of the upper terraces of the valley, but closer to the floodplain. Such locations would have provided prehistoric hunters and/or agriculturalists with a good overview of the valley floor, access to water, and an area of habitation above the area of flood danger. Moreover, based on maps of the valley before the flooding of the lake, there is the potential for exposure of at least 40 unrecorded historic habitation sites and associated roads, bridges, and railroad grades if drawdown continues to the lowest projected elevation.

Both prehistoric and historic sites revealed by further drawdown could be expected to be exposed in the same manner as sites are currently exposed on the shoreline. Some would be present on the shore surface while others would be buried under silts and only identifiable by subsurface testing. Because of the predicted density of prehistoric sites and the potential for so many historic sites to be exposed, it is recommended that, if drawdown is carried out to the 1927' msl elevation that another intensive reconnaissance survey be conducted of newly exposed shoreline to identify and record any such sites.

Because of the high potential for erosion of sites off the tops and faces of the loess bluffs surrounding the lake, it is

recommended that cultural resource survey of the previously unsurveyed areas on those bluffs on U.S. Government lands in Harlan County be continued to evaluate the content and context of those sites.

Based on the evidence gathered from this survey and previous surveys, it is clear that the Upper Republican River Basin in Harlan County and, in particular, the area around Harlan County Lake were the focus of many human occupations and activities in prehistory. Further, models of settlement patterns and information gathered by this survey and previous ones suggest that the density of prehistoric and historic sites surrounding the lake area is greater than previously suspected. Although settlement patterns for most of the groups that have inhabited the area are reasonably well defined, there remain significant gaps in the archeological record of Native American occupations in the project area, particularly in the Archaic, Woodland, Late Prehistoric and Historic Periods. Because of the density of occupation in Harlan County and the high potential for discovery of sites of significant archeological importance or eligible for inclusion in the National Register of Historic Places, it is therefore recommended that a long term plan for a survey of all U.S. Government lands at Harlan County Lake be developed and that further surveys designed to identify such sites be conducted in the future.

Finally, it should be noted that the Harlan County Lake project area also possesses a wealth of paleontological resources, including fossils from the Cretaceous Period and extensive faunal remains from the Pleistocene. Because much of the lake shore is made up of eroded surfaces that expose such material, a policy should be formulated to preserve and protect such resources in areas likely to be impacted by the public or by continuing erosional processes.

Recommendations for Specific Sites

NORTH COVE MAMMOTH SITE (25HN85)

Because of the variety of mammoth remains being recovered from the lake shore (e.g. tooth, tusk, and bone), it is reasonable to expect that more of the mammoth remains are still buried. An assemblage of flaked materials, although of somewhat dubious provenience, was recovered from the same area from which the mammoth remains were recovered. The association of mammoth remains with chipped lithic debris may indicate a Paleoindian site. Therefore, it is recommended that the North Cove Mammoth Site be systematically tested to determine if it is in fact such a site and possibly eligible for inclusion in the NRHP.

OLD REPUBLICAN CITY (25HN82)

Despite previous looting during the 1989-90 drawdown of Harlan County Lake, most of the center of Old Republican City is well-protected from public access by a heavy overgrowth of small cottonwoods and willows and significant portions remain nearly intact. However, the site is so large (up to 366 acres) that most of the outlying residential areas are in places to which fishermen, hunters, and off-road vehicles have access. There is no apparent means at hand to protect the entire area. Nevertheless, Old Republican City undoubtedly contains a wealth of historic archeological information. It should also be noted that there is also a prehistoric component to the Old Republican City area. Therefore, it is recommended that the center of Old Republican City be monitored in order to protect the integrity of the site and that the general area of the site should also be monitored insofar as it is reasonable to do so. Further, because of its size and historic context it is recommended that portions of Old Republican City be subjected to systematic excavation and testing at some time in the future to determine its information potential and to assess its eligibility for the NRHP.

NORTH SHORE AMENDED SITES

Sites 25HN134, 25HN135, 25HN136, 25HN137, and 25HN139 were discovered by this survey to be far more extensive than originally determined by earlier surveys. The most dense concentrations of artifacts from those sites are located near the current active fluctuation zone of the lake and are therefore jeopardized by wet/dry cycling processes, wave cutting, and downslope erosion. Further, the closeness of the sites to one another may indicate that they compose a single large occupation of an Upper Republican culture. Moreover, at least one site (25HN139) has been revealed to be a multicomponent site, containing both Upper Republican and Woodland Period materials.

Therefore, it is recommended that sites 25HN134, 25HN135, 25HN136, and 25HN137 be subjected to systematic testing to determine contextual integrity. Such a testing procedure could be based on a stratified sample of one or more of these sites or a representative stratified sample of each site. Further, it might be prudent to sample the areas between sites to establish continuity or discontinuity between or among them. It is also recommended that site 25HN139 be extensively tested to verify its cultural affiliation(s). Such testing should include an evaluation of the North Shore Amended Sites for their eligibility for inclusion in the NRHP.

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APPENDIX

REPORT ON SITES RECORDED OUTSIDE OF INITIAL SURVEY AREA

Two (2) previously unrecorded sites were identified on the project area that were not exposed by the drawdown of the lake but it was deemed necessary to survey and report them. Of these two, one was a prehistoric site of unknown affiliation (25HN83); the other, a multicomponent site (25HN84) consisting of a prehistoric (probably Upper Republican) and a historic Euroamerican occupation (former Nebraska Governor Schallenberger's residence). At the request of the Nebraska State Historical Society, another historic site (25HN504, the Old Orleans Mill) was surveyed and mapped. (see attached Maps)

Fisherman's Gate Site (25HN83)

The Fisherman's Gate prehistoric site lies south of the Republican River on a small hill slope overlooking a floodplain approximately 1¼ miles west of Alma, Nebraska. The site elevation is approximately 1955' msl. The site was discovered during a pedestrian survey of land adjacent to the Governor Schallenberger Residence site (see below). The lower part of the hill slope was, at that time, part of a plowed field and concentrations of 10 lithic flakes per 20 square meters were observed on the hill slope. The top of the northernmost extent of the hill was part of a grassy strip between 20-30 meters wide serving as a border between agricultural fields. Visibility was near 0% on the surface. Subsurface testing was done by a post-hole auger 10 cm in diameter and 20 cm deep. Five (5) auger tests of the top of the northernmost extent of the hill were conducted. Auger tests were carried out to an average depth of 60 cm. The surface humus layer and previous plow zone extended from 20-27 cm and was a dark brown sandy loam with shallow root penetration. The soil below extended to 60 cm and consisted of a light brown to light grey-brown sandy loess. No cultural materials were recovered from the shovel tests and none of the surface lithic scatter was removed from the site.

The light surface scatter on the exposed downslope surface of the site indicates that it may have been a low intensity occupation site, such as a hunting camp or lithic reduction area. However, the hill extends at least 100 meters to the south, gradually sloping up to 1965' msl. The southernmost part of the hill slope, beyond the grassy strip that was tested, was planted in corn at the time of the survey, preventing access by the investigator. It is possible that more cultural material is present further up the slope that might clarify the cultural affiliation of the site.

The Governor Schallenberger Residence (25HN84)

The Governor Schallenberger Residence is located south of the Republican River on a small hill slope overlooking a floodplain approximately 1½ miles west of Alma, Nebraska. The site elevation is approximately 1955' msl. Part of the site (approximately 25%) is now an agricultural field which bisects the property. Visibility on the surface of the field was 100% at the time of the survey. The remaining portions of the site are either heavily wooded with cottonwoods, junipers, and Osage orange trees, or are densely covered with a mixture of grasses, Russian thistle, sunflowers and feral hemp. Much of this latter weedy cover is so dense as to require the hacking of a path with a machete to gain access for surveying the area. Surface visibility in those areas was 0-10%. A Corps of Engineers access road borders and crosses the property and was surveyed as well. Surface visibility in and along the roadway varied from 85-100%.

The site was called to the attention of the current survey project because of the existence of a standing cast concrete gate structure associated with the site that might be endangered by continued public access to the area. Further, the site had never been recorded by the Nebraska State Historical Society. Because of these facts and also because the property was associated with a significant person in Nebraska history, the site was surveyed and mapped. It was also tested with a standard soil-coring device and also with a post-hole auger to determine subsurface integrity.

Governor Schallenberger (b. 1861, Toulon, IL) was one of the first important businessmen in Harlan County. He established the Bank of Alma, Alma, Nebraska, in 1887, where he also served as cashier. He served as Mayor of Alma in 1897 and as District Congressman in 1900. He became a Democratic candidate for Governor in 1906 and was eventually elected in 1908. After serving his term, he returned to Alma to his 1720 acre farm. Most of his farming activities focused on hogs and short horn cattle. His animals were considered some of the best in the state taking first prize at the Nebraska State Fair in 1906, second prize at the Royal Exhibition in Chicago, eleven firsts in show in 1907, and eleven firsts in show in 1908. He also experimented with the production of cool weather alfalfas, most notably the "Turkestan" variety. He is also known to have kept a kennel and breeding operation of Saint Bernard dogs. His daughter Grace remarked in a letter in 1967 that, at one point, he had 75 dogs in his kennel. Governor Schallenberger was a highly respected man in Alma and in Harlan County and was active in politics and business there until his death in 1937 (Alden Publishing Company 1909, Editors of the Harlan County Journal 1906).

During pedestrian survey of the agricultural field and the roadway cultural materials from both historic and prehistoric

periods were observed and a limited collection made. Prehistoric materials included 12 lithic flakes of Niobrara jasper/chert and 2 small, eroded fragments of sand-tempered body sherds probably of Upper Republican cultural affiliation. Historic materials observed and recovered included 1 light blue glass bottleneck with applied lip, 2 pieces of yellow ware sherds (1 rim sherd with mottled green glaze), 1 china cup rim sherd, 1 ironstone base sherd with a partial maker's mark, a cast iron ornament from an iron fence, two (2) 30-caliber bullet shell casings, and 1 small fragment of mussel shell. Observed on the surface but not recovered were: fragments of limestone and brick (some glazed), fragments of sewer tile, glass and crockery, and some small fragments of china and ironstone ceramics.

During pedestrian survey of the wooded areas, the cast concrete gate structure was mapped, measured and photographed. The distance from the gate to the area on which the house and other farm structures had stood was paced off (approximately 175 meters). The area on which the house and other associated structures was surface surveyed for remains of structures and tested for subsurface integrity. The buried limestone foundation of the house was located easily. The outline of the foundation could be seen as a shift in vegetation pattern. The foundation appears to be reasonably intact, based on soil cores and probe tests. Fragments of brick and limestone were recovered during the subsurface tests but were not collected. The house site is well protected from disturbance by a dense overgrowth of weeds and small trees. The rest of the farm building foundations are concealed by a nearly impenetrable cover of Russian thistle (Kochia sp.).

The presence of prehistoric materials associated with the historic site further demonstrates that settlement patterns of historic and prehistoric people coincide throughout the valley (see "Old Republican City" above, Adair and Brown 1987, Watkins 1988, Moore 1988).

Orleans Mill Site (25HN504)

The Orleans Mill Site is located approximately ¾ mile southeast of the town of Orleans, Nebraska in a hill by an old railroad grade on the north bank of a branch of Flag Creek. Before the flood of 1935, the Republican River flowed where the creek does now and provided first water power and later water for steam power to the mill.

The Orleans Mill was owned and operated by O.K. Olmstead. After the building of a dam in 1876, the mill was first constructed in 1877 and later rebuilt in 1880. Originally built as a saw mill, the Orleans Mill was later reconstructed to be a flour mill. The main mill building was 2½ stories high and 45' long by 45' wide. It had 3 sets of burrs with a capacity of 200

bushels a day (Kuhl and Dunlay 1972).

The concrete lock and gate structure for the dam diversion is still standing in a heavily wooded area on the creek bank below the mill site. Large chunks of foundation concrete can be seen scattered across the site along with some brickbats. No outline of a foundation is visible, however. No cultural materials were collected from the Orleans Mill Site.

RECOMMENDATIONS

Fisherman's Gate Site (25HN83)

Although surface survey revealed a moderately dense lithic scatter, shovel testing recovered no further cultural resources. The site is located on an eroded terrace (T1) which indicates the possibility of their being more deeply buried cultural resources. Although there might be more deeply buried resources, it is not recommended that any further testing of the site be undertaken at this time.

Governor Schallenberger's Residence (25HN84)

The cast concrete gate to the residence of former Nebraska Governor Schallenberger's residence constitutes standing architecture. Moreover, surface survey and subsurface testing indicate some contextual integrity to the site. Further, the farmstead is unusual in that it not only operated as a ranch, but as a kennel, and as an experimental farm. Furthermore, it was owned and operated by a member of the upper middle class and is, thus, atypical in the general context of the archeology of historic farmsteads in south central Nebraska. Finally, it was owned by a significant person in Nebraska's history. Therefore, it is recommended that the site be subjected to further intensive archeological testing to determine its eligibility for inclusion in the NRHP.

Orleans Mill Site (25HN504)

The Orleans Mill Site is in no way threatened by public access or by other impact. It is currently covered with a dense cover of grasses and weeds. The old diversion dam lock and gate system, although showing some marks of vandalism dating to the 1980s, is now concealed in dense woods. No construction or other projects threaten to disturb the area. Currently, no systematic archeological survey of mill sites in Nebraska is planned (Robert Bozell, personal communication 1992). Because the best way to preserve such sites is to leave them alone, it is recommended that nothing be done to disturb the Orleans Mill site further. Nevertheless, as with all the cultural resources in the area, it is recommended that the site be occasionally monitored and visually inspected to evaluate any future potential impacts to

the site.

GLOSSARY OF TECHNICAL TERMS

- aggradation** -- a modification of the earth's surface in the direction of uniformity by deposition.
- alluvium** (*adj.* alluvial) -- clay, silt, sand, gravel or similar detrital material deposited by running water.
- Altithermal** (also called the **Hypsithermal** or **Atlantic**) -- Climatic period from 8,500 bp (before present) to 5,100 bp during which the Pacific air that characterizes grasslands expanded into central Minnesota, causing drought in the northern Plains and an increase in annual mean temperature.
- artifact** -- a product of human activity such as stone tools, flakes, pottery, kitchen waste, etc. **Diagnostic artifacts** are artifacts that define a specific culture, or cultural or temporal period.
- artiodactyl** -- any of an order of hoofed mammals with an even number of functional toes.
- biface** -- an edged tool, generally of made of stone, that has been sharpened by beveling both sides of the working edge.
- bp** -- before present.
- calcite** -- a mineral CaCO_3 consisting of calcium carbonate crystallized in hexagonal form including common limestone, chalk, and marble.
- chert** -- a rock resembling flint and consisting essentially of cryptocrystalline quartz or fibrous chalcedony.
- context** -- in archeology, the entire temporal, spatial, and physical environment of the site.
- Cretaceous** -- (135 million years ago [mya] to 65 mya) of, relating to, or being the last period of the Mesozoic era or the corresponding system of rocks.
- cutbank** -- the sheared remainder of a hill or riverbank that has been cut away by erosion.
- daub** -- material used to cover or coat walls, such as mud, adobe, or plaster.
- detritus** (*adj.* detrital) -- loose material, such as rock fragments, that results directly from disintegration,

destruction, or wearing away.

ecofact -- material found in an archeological context that is not the product of human activity, such as roots, seed rain, rodent bones or holes, etc.

ecotone -- a transition area between two adjacent ecological communities usually exhibiting competition between organisms common to both.

eolian -- borne, deposited, produced, or eroded by wind.

ephemeral sites -- archeological sites that characterize short-term occupation. Such sites usually consist of a shallow layer of artifacts representing a single depositional episode or event.

ephemeral creeks -- creeks that flow only occasionally when groundwater or rainfall is sufficient to supply them.

feldspar (feldspathic) -- any of a group of crystalline minerals that consist of aluminum silicates with either potassium, sodium, calcium, or barium and that are an essential inclusion, of nearly all crystalline rocks.

fluvial -- produced by stream action.

forb -- an herb other than grass.

geomorphology (adj. geomorphological) -- the science that deals with land and submarine relief features and seeks a genetic interpretation of them.

grit -- crushed rock or gravel used as temper in pottery manufacture.

grog -- crushed ceramic material used as temper in pottery manufacture.

Holocene -- (ca. 12,000 bp to the present) the most recent epoch of the Quaternary era (3,000,000 bp to present).

jasper -- an opaque cryptocrystalline quartz of any of several colors: especially, green chalcedony.

lithic (adj. lithic) -- in archeology, artifacts or debris made from stone.

loam -- a soil consisting of a friable mixture of varying proportions of clay, silt, and sand.

loess (adj. loessial) -- an unstratified, usually buff to

yellowish brown loamy deposit found in North America, Europe, and Asia and believed to be chiefly deposited by the wind.

megafauna -- generic term referring the extinct species of large mammals of the Pleistocene epoch - includes mammoth, mastodon, giant bison, saber-toothed cats, etc.

merycoidodon -- a genus of Oligocene (38 mya to 25 mya) four-toed artiodactyls of the size of a peccary and the form of a swine.

Mesozoic -- (225 mya to 65 mya) of, relating to, or being an era of geological history including the interval between the Permian and the Tertiary and marked by the dinosaurs, marine and flying reptiles, ganoid fishes, cycads, and evergreen trees.

midden -- a refuse heap.

mosasaur -- any of a genus (*Mosasaurus*) of large extinct aquatic fish-eating lizards with limbs modified into paddles, related to the recent monitor lizards.

mya -- million years ago.

paleoclimatology (*adj.* **paleoclimatic**) -- a science dealing with the climate of past ages.

paleoecology (*adj.* **paleoecological**) -- a branch of ecology that is concerned with the characteristics of ancient environments and with their relationships to ancient plants and animals.

paleoenvironment -- ancient environment.

paleontology -- a science dealing with the life of past geological periods as known from fossil remains.

paleosol -- an ancient soil surface or horizon, usually determined to be ancient by its stratigraphic position beneath the contemporary surface.

pedology (*adj.* **pedological**) -- study and science of soil(s).

Permian -- (275 mya to 225 mya) of, relating to, or being the last period of the Paleozoic era or the corresponding system of rocks.

Pleistocene -- (3,000,000 bp to ca. 12,000 bp) of, related to, or being the earlier epoch of the Quaternary period or the corresponding system of rocks.

- pluvial** -- resulting from the action of rain.
- provenience** -- the location of an artifact or site in three dimensions.
- quartz** -- a mineral SiO_2 consisting of a silicon dioxide that occurs in colorless and transparent or colored hexagonal crystals and also in crystalline masses.
- quartzite** -- a compact granular rock composed of quartz and derived from sandstone by metamorphism.
- radiocarbon** (^{14}C) -- a radioactive isotope of carbon whose decay rate is used to measure the age of organic materials.
- retouch** -- the removal of flakes from a lithic tool or other implement to resharpen the edge.
- rill** -- channel made by a small stream, a runoff channel.
- shale** -- a fissile rock that is formed by the consolidation of clay, mud, or silt, has a finely stratified or laminated structure, and is composed of minerals essentially unaltered since deposition.
- sherd** -- a piece of broken ceramic or pottery.
- soil matrix** -- in archeology, the soils in which the archeological material (artifacts, features, etc.) is contained.
- stratigraphy** -- a series of layers or layered deposits. In archeology the **principle of stratigraphy** is applied to mean that, in a layered series, the lower layers are older than the upper layers.
- temper** -- a substance added to another by mixing to improve its properties. In pottery, temper is added to clay to improve qualities such as elasticity, hardness, and to prevent cracking or breaking during the drying or firing process.
- Tertiary** -- (65 mya to 3 mya) of, relating to, or being the first period of the Cenozoic era or the corresponding system of rocks marked by the formation of the high mountains (the Alps, Caucasus, and Himalayas) and the dominance of mammals on land.
- transect** -- a sample area usually laid out in a long continuous strip.

turbid (n. turbidity) -- opaque or thick with sediment.

uniface (adj. unifacial) -- an edged tool, generally of made of stone, that has been sharpened by bevelling only one side of the working edge.